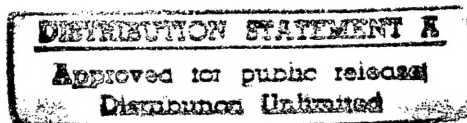




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Promotion of Basic Research in Government Labs

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Science & Technology

Japan

Promotion of Basic Research in Government Labs

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Promotion of Basic Research in Government Laboratories

926C0026 Tokyo NISTEP REPORT
NO. 20 in Japanese Sep 91 pp 1-87

[NISTEP Report No. 20 prepared by Eiichi Muto and Yukihiro Hirano, 1st Policy-Oriented Research Group, National Institute of Science and Technology Policy, Science and Technology Agency]

[Excerpts]

Introduction

The promotion of creative basic research has become one of the most important issues for Japanese science and technology policy. However, it would appear that the concept of what constitutes basic research, together with ideas on how it should be managed, have yet to be fully established. To clarify what has prompted private Japanese companies to undertake basic research, which they have been doing since the latter half of the 1980's, Yukihiro Hirano and Chiaki Nishigata of the National Institute of Science and Technology Policy in January 1990 published a report entitled "Basic Research Activities by Private Corporations in Japan" (NISTEP REPORT No. 8) [see also: JPRS-JST-91-036, "STA Survey Report on Basic Research Activities by Private Corporations," 3 December 1991]. In that report, the authors expressed both misgivings and expectations concerning the future prospects for basic research in those government and public laboratories whose primary mission is to conduct basic research. Thus we felt a strong need to examine the state of basic research in government laboratories.

To that end, we decided to narrow the scope of our survey to government laboratories only, and to examine the state of basic research in those laboratories. As for the survey method, we used the same method that was employed in the surveys of basic research activities being conducted by private corporations in Japan. To be specific, we invited researchers responsible for the management of research in government laboratories and in those public laboratories that can be characterized as quasi-government laboratories to attend a series of seminars at NISTEP. The purpose of the seminars was to shed light on the character of basic research activities in those laboratories and to illuminate the problems associated with the management of those research activities. The seminars consisted of lectures by the invited researchers followed by an exchange of views between the guests and the audiences, which consisted of NISTEP researchers and government officials in charge of science and technology policy administration at STA.

In putting together this report, the authors have extracted various problems associated with the management of basic research in government laboratories. These were distilled from issues that were raised during

the series of seminars. We sorted them out and added our own considerations. All responsibility for this report rests with us.

Simultaneously, we polled the directors of government laboratories to determine the state of the research environment in their laboratories through the use of a questionnaire. The findings are contained in the text as needed, and their broad outlines are provided as reference data.

1. Government Laboratories and Basic Research

Before discussing basic research in government laboratories in Japan, we consider it important to address the role of government laboratories, that is, to determine initially whether they are assigned to conduct basic research or not.

In its report dated 22 July 1985, the Provisional Council for the Promotion of Administrative Reform, an advisory body, submitted a proposal entitled "On the Way Science and Technology Administration Should Be," which was aimed at increasing overall coordination capabilities.

The proposal stated that up to that point the emphasis on research and development in Japan had been placed on applications and development, especially the development phase, by improvising on ideas and the results of basic research obtained from other advanced countries, particularly the United States and Europe. It also stated that one of the most important tasks facing research and development in Japan was to transform its research structure from one aimed at catching up with a high priority placed on applications and development, into one that gave a high priority to creative and basic research.

With regard to government laboratories, the proposal states: "Government laboratories are widely divergent as to mission, contents of operation, organization, and structure because they have different backgrounds. From the perspective of promoting science and technology policy, the report recommended that 1) to the extent possible those fields of research where the abilities of the private sector can be put to good use should be left to private businesses, while government laboratories should concentrate their activities on tests and research that are needed from the viewpoint of administration. 2) Government laboratories should devote themselves to research and development in those fields of basic research and large-scale research and development that are likely to be beyond the ability of private businesses, and to execute theme-oriented research and development projects. 3) Government laboratories should strive to increase their functional capabilities, with the provision that in so doing the abilities of the private sector will be put to the greatest use. This can be done by building large research and experimental facilities and opening them to the private sector as well, and by fostering foundations and conditions conducive to research and

development, such as the supply of advanced machinery and materials and genetic resources, and so forth." The proposal further says: "The various government ministries and agencies are required to make great efforts to improve and refurbish the research laboratories under their jurisdiction, emphasizing those research institutes geared to new needs, such as creative and basic research."

On 16 July 1985, the government passed a cabinet resolution committing it to do its best to implement the Administrative Reform Council's recommendations.

The "Outline of Science and Technology Policy for Japan," which sets out the basis of the government's science and technology policy for the future, says that "basic and pioneering research and development should be increased in the government laboratories." Thus increasing basic research in government laboratories has been established as a national priority.

After reconfirming that the role of government laboratories is to contribute to the execution of government policies by undertaking research activities, report No. 13, "On the Way National Experimental and Research Institutes Should Operate From a Medium- to Long-Term Perspective," submitted by the Council for Science and Technology (CST) on 28 August 1987, identifies the following six tasks as basic policy for government laboratories.

(1) With regard to research in areas that do not conform to market principles, such as ensuring the safety of the people and public welfare, and with regard to research in fields where there exist policy requirements for research, such as securing food and energy resources, government laboratories should formulate their research programs after fully taking into account administrative requirements and popular needs.

(2) With regard to research in fields involving fundamental industrial technologies where their activity may compete with private businesses as the research and development capability of the private sector increases, government laboratories should limit their research activities to areas that may be too risky or too costly for private businesses, even though their research and development capabilities may have greatly increased, to undertake on their own.

(3) With regard to survey and research activities involving the accumulation of basic scientific data in such fields as standards and weather, government laboratories should steadily continue research on high-priority projects from a long-term perspective.

(4) To help promote fundamental and pioneering research in Japan, government laboratories should undertake research that is aimed at creating new technical seeds and/or research that is basic to the solution of technical tasks.

(5) In areas that require coordination with foreign countries, such as international standards and specifications, government laboratories should contribute to international society by compiling representative Japanese scientific and technical data, or by engaging in cooperative research.

(6) With regard to the research infrastructure and environment, such as refurbishing large-scale research and experimental facilities and opening them to the public, or supplying advanced machinery, equipment and genetic resources, government laboratories should continue to build up the infrastructure with the idea of utilizing the abilities of the private sector in mind, and achievements thus obtained should be made available to the general researcher.

In addition to these basic policies, the CST report emphasizes two points that require special policy considerations:

(1) Strengthening basic and pioneering research aimed at creating new technological seeds.

(2) Increasing Japan's contribution to the international community and promoting internationalization.

A lecturer described the changes in the role that government laboratories are expected to play by using the following expressions: "a change from a 'developing country type' burdened with too many routine operations to an 'advanced country type' centered on research," or "a change from serving 'short-term administrative objectives of the relevant ministries and agencies' to 'services to the taxpayers as a whole in a broad context.'" Another expressed the changing role by saying that "it is a transition from an 'experiment station character' in which the objective is to import some new technology and work for its growth to a 'research institute character' in which a consciousness change occurs in that an academic paper is worth its name only if it is printed in a prestigious English-language journal."

CST report No. 13, entitled "Strengthening Basic and Pioneering Research Aimed at Creating New Technological Seeds," states: "Research is expected to lead to the creation of new technologies, but one should not expect specific applications to be found. That is, the objective of the research should be to identify the so-called seeds and solutions of technical tasks. The emphasis should be placed on 'getting back to basic research' in order to break the deadlocks in applications and development research, and on research aimed at obtaining new insights into natural phenomena." Noting the need to make "an increased contribution to the international community," the report says: "It has been said that Japan has been contributing less to the international community in terms of coming up with achievements in the various fields of basic research, which are used as the common property of the world, than countries in Europe and America. Since government laboratories are organizations in whose activity the administrative requirements of the government are directly reflected, they,

being part of the public sector charged with the execution of basic research, should increase their activity in the fields of basic research and thereby contribute more to the international community."

As the reports from the Council for Administrative Reform and the CST demonstrate, there exists a consensus of opinion among the relevant organizations, beginning with the government, on the need for enhanced basic research in government laboratories. If one examines the series of concrete policies put forth by the government, it cannot escape notice that they all are aimed at promoting basic research in government laboratories. One lecturer, however, has pointed out that the priority given to basic research in government laboratories is not as high as is proclaimed by the Center. Another lecturer stated that, "there are no outward constraints on basic research, but in reality researchers are conducting basic research furtively in the scarce time allotted, and they are doing it on weekends or holidays to their great distress." These statements by researchers are indicative of the actual importance accorded to basic research in government laboratories.

As can be seen from the above, a call for the promotion of basic research is gaining steam at the central level, but a similar enthusiasm has yet to penetrate the government laboratories themselves. Why is this? Those concerned would be well advised to take a close look at the actual state of basic research and to study measures for the future. [passage omitted]

3. Points To Be Kept in Mind in Promoting Basic Research Effectively in Government Laboratories, and Obstacles

Government laboratories contain numerous organizations with different characters and staffs, and hence the problems they face are infinitely varied. Making a sweeping statement about these diverse institutions would be difficult, but an overall evaluation of the lectures given by the invited guests suggests that there is a consensus about the need to implement the following measures if basic research in government laboratories is to be promoted effectively.

3.1 Securing Talented Research Personnel Favorably Disposed Toward Basic Research

Many lecturers stated that the most important element in promoting basic research was "people." They emphasized the need for excellent research personnel who are favorably disposed and highly motivated to do basic research. They used such phrases as "basic research demands a sense..." and "basic research requires freedom, i.e., freedom from established concepts. In other words, it requires a flexible mind. The process of probing for the truth demands a 'flexible mind.'"

Needless to say, these prospective basic research personnel would have to be fully motivated and willing to

take up research as their life-long job or *raison d'être*. Unless a person is highly motivated, he would be unfit for basic research.

To invigorate basic research, the first priority is to secure researchers who have a sense for it, a flexible mind, and who are burning with zeal for basic research.

For government laboratories, however, securing this kind of talent is becoming an extremely difficult problem.

With respect to securing researchers, government laboratories find themselves in a difficult situation: Fundamental government policy is forcing these institutions to reduce their staff according to a set schedule.

In all government organizations, not only in government laboratories, hiring employees as needed is not permitted. In order to hire a permanent employee, the legally fixed number of officials must be increased, but in reality there is little likelihood that this number will be changed. Another particular feature of Japanese practice is that the mobility of researchers is very low. Thus only a few researchers in a government laboratory will seek employment in other institutions, which in effect prevents government laboratories from hiring talented research personnel. In a questionnaire on the research environment in government laboratories (hereafter referred to as the Questionnaire), 88 percent of the respondents (government laboratory directors) replied that obtaining additional researchers would be their first priority if they were to request a staff increase.

With regard to the ceilings on the number of employees, one lecturer went to far as to say: "The number of researchers who will be engaged in basic research should be determined after taking into account the overall requirements of the government, and these researchers should be apportioned among the various government laboratories as needed."

It was also pointed out that even if the employment ceiling were raised, the difference in pay between the private and the government sectors stands as an obstacle to the recruitment of excellent researchers. Even if government laboratories wished to recruit researchers from the private sector who had performed well at private business research institutes, the reality seems to be that the talks would lead nowhere because of the difference in pay between the private and government sectors.

In fact, 79 percent of the persons who responded to the Questionnaire endorsed the assertion, "Government laboratories are having great difficulty in recruiting talented researchers because of poor salaries and inferior research environments." This further demonstrates the seriousness of this problem.

One lecturer pointed out that: "Salaries are no longer a carrot with which to lure researchers, but have become the reason for losing them." His assertion is that since

the salaries of government researchers are determined across the board by people who are far away from the people who actually hire them (the National Personnel Authority and the Diet), government laboratories have only limited discretionary power when it comes to hiring, and this is making it extremely difficult for them to recruit excellent researchers of their choice.

As for pay, one lecturer noted that "the salaries of government researchers are lower than those of researchers in private businesses." Since the salaries of national public service personnel are determined based on salaries in the private sector, what led the lecturers to conclude that the salaries of government employees are lower than those of workers in private businesses? The National Personnel Authority report made public in August 1991, which recommended pay raises for government officials, contained the following passage:

This year's pay raises for government administrative officials have been determined after taking into account the difference in pay between the private and government sectors. We believe it would be appropriate for the difference of ¥ 562 in pay to be used to improve the salaries of government ministry and agency officials who are paid in accordance with the wage table for administrative officials shown in Table 1. With regard to pay for government officials other than administrative officials, their salaries need to be increased—on the premise that there exists a balance between the salaries of nonadministrative government officials and those of administrative government officials, after taking into account the movements in the pay of their equivalent counterparts in the civilian sector.

As the report says, on the major premise of maintaining a balance in pay between nonadministrative government officials and administrative government officials, the salaries of government laboratory researchers have been determined after taking into account the salaries of researchers in private businesses. In other words, the wage levels of researchers in private businesses are not directly reflected in the salaries of government researchers. Furthermore, even among private businesses, large corporations that employ large numbers of researchers are paying relatively higher wages to their employees, and this seems to reinforce the perception among government researchers that they are underpaid.

Regarding the current method used to determine the salaries of government researchers, the FY1987 report of the National Personnel Authority says:

In 1974, apart from the consideration for the difference in pay between the government and the private sector, a special pay raise was put into force for teachers and nurses, aimed at recruiting talented personnel. In this connection, in arriving at the recommendation for pay raises submitted in the

summer of the same year, a new method of comparison was employed. That is, in place of the conventional method of comparison in which salaries are compared for job categories which exist in both the private and government sectors (jobs listed in 10 Wage Tables in the case of the government), a new method of comparison was employed, under which the wage differentials between private and government sectors are determined by comparing the salaries of officials in the government sector and their counterparts in the private sector, i.e., clerical and technical workers, skilled workers and laborers, who are the key elements and at the same time comprise a majority in both the government and private sectors. Wage increases for job categories other than administrative jobs will be determined after taking into account the balance within and outside the government.

It seems that the National Personnel Authority is beginning to entertain doubts about the way in which salaries currently are being determined. An article entitled "Coping With New Tasks Aggressively: Basic Directions for Operations in FY1991," published in the April issue of the National Personnel Authority Monthly Report, introduces statements by the director of the executive office and chiefs of the various bureaus delivered at a meeting of personnel management officials held on 28 February to discuss the basic directions of the Authority's operations in FY1991. Regarding pay, the article says there are four major issues that need to be addressed. The third of these issues is as follows:

This involves the problem of how to effect pay raises for different categories of jobs according to the specific circumstances surrounding those jobs. There are numerous types of jobs in public service. The key is how to establish a wage system that satisfies the requirements of each of those job categories for personnel and which reflects the actual state of work on the jobs. But, in doing so, a balance must be established both between the government and private sectors, and between jobs within the government service itself. The National Personnel Authority is being called on to examine each job closely and to take appropriate action.

The fourth point says: "This pertains to correct and appropriate management of the wage system. It is unavoidable in a sense that government officials are treated differently with respect to promotion, promotion in status, and special pay raises. It is requested that ministries and agencies conduct thorough reviews of each of their staffs with regard to their performance on the job and hand out rewards according to specific merits."

Whether basic research in government laboratories will succeed or not depends on whether they are able to recruit personnel who are rich in conceptual resources and have flexible minds, and at the same time are willing and dedicated to research. If government laboratories

are to compete equally with private businesses in the race to recruit such gifted talent, drastic improvements will have to be made in the treatment of such expectant researchers. As for researchers engaged in basic research, a thorough review will have to be made of the research environment in which they are placed, such as the working hours, place of work and work space, as well as on the overall working conditions.

The methods by which government laboratories have been recruiting researchers also were criticized. One lecturer stated: "In order to recruit new researchers, the government laboratories must reinforce their structure for personnel recruiting. When a researcher from some research organization attends an academic meeting, it is important that he be prepared not only to engage in academic exchanges, but also to ferret out personnel suited for work in his office." It was pointed out that "the existing system for recruiting researchers, which is based on the principle of selection through testing, has prevented government laboratories from selecting new researchers effectively."

Regarding the examination for service, a lecturer made the following observation: "The examination for government service that the National Personnel Authority gives to aspiring government researchers is the same test as that for aspiring public servants who will be in charge of general administrative affairs, and the rich conceptual resources needed in undertaking basic research do not mesh with the examination for government service." In the examination for government service the fields of learning are classified broadly, so there is a very low probability that an applicant who has passed the test for a specific discipline has majored in a field of learning corresponding to that which the recruiting research organization is seeking. Hence, the reasoning goes that the examination for government service presents an obstacle to the recruitment of researchers who are richly endowed with the conceptual perceptions necessary for basic research.

In light of this situation, the National Personnel Authority, in order to recruit better qualified personnel for government laboratories than has been the case until now, implemented a new measure in March 1988, which contains the following provision:

In the case where there are no qualified persons among those who have passed the Category I examination (Authors' note: The Category I examination is a test for identifying a select group of neophyte public servants who are expected to assume leadership positions in government as high-ranking officials, engineers or researchers; the test is given by the National Personnel Authority) in specific fields, those positions may be filled with people who are selected independent of the Category I examination with approval from the National Personnel Authority, provided that the candidate is well versed in his specialty and is a graduate of a college doctoral program with advanced achievements to

his credit. The concerned government ministry or agency may hire such an individual, under certain conditions, and provide him with the same treatment given to those who have passed the Category I examination. (From "On the Hiring of College Doctoral Program Graduates as Researchers," written by the Planning Division in the Recruitment Bureau of the National Personnel Authority and published in the August 1989 issue of the National Personnel Authority Monthly Report.)

Those who are hired under the above recruitment system are treated as equals to those public servants who have passed the Category I examination, but to prevent personal connections from interfering with the selection process, the system is placed under the following constraints:

- (1) Recruitment should be an open system, giving members of the public an equal opportunity to apply.
- (2) Selection should be based on an evaluation of the applicant's written work and research achievements.
- (3) A screening commission should be established to select the successful applicant.

Enactment of the above measure has opened for government laboratories a procedure for hiring qualified researchers from among the broad general public, in addition to those who have passed the Category I examination.

Although they were not specifically aimed at research personnel alone, many improvements have been made in the contents and methods of the Category I examination for public servants. These include the introduction of a testing system under which the applicant can select questions of his choice out of so many questions on the examination paper.

These measures for improving the hiring system have been substantial, but there remains considerable room for improvement.

3.2 Increases in Expenditures for Research and Improvements in the Availability of Funding for Research

As expected, many lecturers addressed the question of expenditures for basic research. A strong argument was made that "the funding for research is too small at present." Many of the guest speakers talked about the difficulties they have experienced in obtaining funding for research. Among them, the complaint most frequently heard was this: To obtain funding for a project, I engineered it into a form that suited the taste of the administrative authorities, and the result is that I am spending much of my research time clearing up the mess. One lecturer said the following about his struggle to persuade government authorities to appropriate funding for his basic research: "In trying to obtain funding for a research project, the chance of succeeding would be very slim if the project were strictly in the field of basic

research, but the prospects are brighter the more one combines it with applied research."

Researchers at government laboratories apparently are convinced that when it comes to budget adjustments, the first item to go into the dust bin is expenditures for routine operations such as equipment upkeep. One lecturer described the difficulty involved in the renewal of equipment in the following terms: "Even when the equipment is obsolete, purchasing new equipment is not a simple matter; nor can the equipment be simply disposed of (because of the strict property management requirements)."

Furthermore, a number of speakers complained about the lack of experimentation space in laboratories. One lecturer went so far as to say that the thing he wanted more than anything else, including money and personnel, was space. Another lecturer lamented the lack of sufficient laboratory space allotted to each researcher, and the poor layout of the laboratory:

"It is difficult to decide which is better—to give each researcher his own office or to pool all researchers in a big room. This is because the decision is affected by a number of factors, such as the field of research or the dispositions of individual researchers. However, the building should have enough space and a structure that would make it possible for either option to be adopted. Again, telephones should be installed in sufficient numbers to permit each researcher to have his own telephone, which would relieve the researcher from the trouble of getting calls for someone else."

The government laboratories, it seems, have been having much more trouble in obtaining funding for such jobs as maintenance, refurbishing, renewal, or office expansion than in obtaining funding for much more expensive items like the installation of large pieces of equipment. In other words, obtaining funding for a specific lubricant for research is difficult. This probably is one of the characteristics associated with government laboratories, as opposed to private research institutes.

After admitting a need for an increase in the budget, the remark was made that, given the setup for budgetary appropriations, depending on how the effort for an increase in funding is made, the result could adversely affect basic research:

Under the current budgetary system, if you are going to obtain research funds, you will have to come up with a new research theme. In other words, the request, "I am going to do so and so, so I need some money," will go through the bureaucratic red tape with relative ease. However, since the total sum of funds available for research is limited, the amount of funding per research theme will have to be smaller. In order to secure a fairly large sum of money, you will have to come up with a large number of research themes. However, the effect of controlling so many research themes is likely to be

that you are overwhelmed by the kinds of work that have nothing to do with basic research.

The constraints that arise from the fact that the government laboratories belong to government ministries and agencies also were pointed out. As a matter of fact, since the funds available to government laboratories are appropriated within the framework of the budgets for the related ministries and agencies, how much funding a government laboratory may be able to secure is affected by how much importance the relevant ministry or agency attaches to the laboratory. Faced with a tight budgetary situation, government ministries and agencies are likely to have administrative requirements that supersede research requirements, and thus expenditures for research may have to be cut. Those ministries and agencies that failed to secure enough funds for their laboratories for the reasons mentioned above reportedly have been accused by knowledgeable individuals as not being qualified to have a research laboratory.

One lecturer argued that "the amount of money needed for basic research in government laboratories should not be left to the discretion of individual government ministries and agencies, but the appropriations should be determined from the broad perspective of government policy." Why a government-wide approach to basic research is essential was emphasized in the following remark: "It is too great a loss of time and money for individual government laboratories to come up with persuasive explanations that will help convince their parent ministries and agencies of the importance of basic research in implementing their administrative policies. The work should be tackled from the perspective of an overall government policy." Another lecturer refined this point: "To be specific, funding for the 'priority basics' should be greatly increased in the Special Coordination Funds for Promoting Science and Technology."

One lecturer made the following proposal: "Why not secure money for all government-sponsored basic research as a lump sum and distribute it among the government laboratories according to the potential of each laboratory and the country's needs? What about distributing research spending according to public bidding?"

Great expectations were expressed by the guests for the "Sakigake (Pioneering) Research 21," a research project that the Science and Technology Agency plans to start in FY1991 in order to support the types of research activities that are free from the bounds of organizational limits. In the "Sakigake Research 21," important research fields are to be selected, and ingenious and creative research themes will be invited broadly from researchers at private research institutes, colleges and universities, and government laboratories.

A diversification in funding for research is also expected. That is, funding for a variety of research menus is expected, such as for research activities by private researchers, research activities involving a few

researchers, research activities involving several tens of researchers, large-scale research projects, research activities that will directly benefit society, research activities aimed at Nobel prizes, etc.

On the whole, in addition to the dearth of funding for research, there is a problem with the way in which research funds are being used. Flexible budget management is difficult. That is, diverting an appropriation for one research scheme for use in another is difficult. Requests for improvement were frequently heard at the series of seminars regarding expenses for such small items as travel, supplies, and maintenance. One lecturer lamented that "travel expenses for attending academic meetings in Japan and abroad are not large enough, and we have no money to purchase supplies." One individual voiced the opinion that, "If only we had some money that we could use at our own discretion, things would go much smoother." In this respect, someone else spoke highly of the "scholarship contribution" system adopted by the national universities. National universities are reportedly taking advantage of the scholarship contribution system to raise funds for travel.

Another reason for the lack of flexibility in the way in which research money is being used has something to do with the way in which the government budget is appropriated on a year-by-year basis. One lecturer observed that the fact that "the accounting term changes from one fiscal year to the next has nothing to do with the progress of research. In this respect, some flexibility is desired for budget management." Another lecturer complained that the "pressure for the budget to be used up by the end of the fiscal year represents an obstacle to effective use of the budget." One individual offered the following suggestion as to how to utilize small budgets effectively: "Isn't it about time that we be permitted to manage budgets in a way that permits people to pool their budgetary appropriations for 2 years to purchase something that they could not buy with their appropriation for a single year?"

Almost all respondents to the Questionnaire replied that improvements need to be made to the way in which budgetary appropriations are being used. Sixty-five percent of the respondents took issue with the statement that there should be "no diversion of funds between research and travel expenses," while 24 percent complained about the "lack of flexibility in carrying the budgetary appropriation for one fiscal year over to the next." In view of the fact that 89 percent of the respondents took issue with these two points, they would seem to be the greatest obstacles to effective budget management.

In view of researchers' complaints that "people in management positions at the government laboratories are always as preoccupied with financing as the owners of small and medium-scale businesses," improving the way in which research expenditures are handled in the government laboratories, we believe, is an urgent task.

3.3 Giving the Researcher Labs Increased Discretionary Power

There is a growing recognition that if basic research is to be carried out effectively, it is important that researchers be free to pursue their own programs. As one lecturer asserted: "Provided that we manage to secure highly talented researchers, the best way to improve their efficiency would be to turn them loose with minimum supervision."

Placing too many constraints on the freedom that a researcher enjoys not only blunts his creativity but also results in a waste of his research time. This is because he has to devote his precious time to such chores as working out a path from the genesis of an idea, planning how to avoid the constraints he faces to reach his goal, preparing for the presentation of the idea, and compiling the necessary data for procedural purposes. The result is that the researcher's "time to think," the most important element of basic research, is greatly reduced, and he is forced to divert his attention away from the field where his ability can be put to the greatest use. For this reason, research freedom is considered to be a matter of great importance.

Since government laboratories are government institutions, one might reasonably expect that researchers there should not hope to have complete control over the selection of their research themes. But their complaint is that "what suits the government" has too much weight in determining the research themes to be pursued. Researchers at government laboratories seem to have a strong desire that decisions about which research themes to pursue be left with the people who actually do the research.

With regard to the selection of research themes, one lecturer offered this insight: "The process is dictated by what suits the government. The objective is to meet short-term administrative needs, and there is no grand strategy underlying research. At times, these administrative needs are not needs in the real meaning of the word, and the research themes have been selected for the simple reason that they are acceptable to the whole ministry bureaucracy or that they are most likely to win approval of the budgetary authorities." If the yardstick for the selection of a research theme is whether it is salable to the central bureaucracy, the short-term interests of the parent ministries and agencies allegedly take precedence, with the result that such factors as the presence of a research capability with which to implement research accurately and the existence of a long-term strategy are not fully considered. All these elements are viewed as obstacles to the enhancement of basic research.

From the perspective of the effective utilization of a limited budget, efforts to avoid redundancy in research themes have been made in the course of negotiations for budgetary coordination among various administrative departments. At the lecture session, this practice was criticized as having the following adverse effects:

(1) Suppose several researchers are working on the same theme at the same time, and independently. Each will approach the research from his own perspective, so it is a good thing for several researchers to be engaged in research on the same theme. However, in the circumstances described above, competitive research as such would not be allowed.

(2) Competition would be inhibited, resulting in less vitality.

(3) In order to protect their vested interests, and given the attitude of "Let's rake in anything we can lay our hands on," the administrative departments concerned would be scrambling to get funding even for research for which they do not have competent researchers.

As can be seen from the remark, "It is often the case in research activity that a good result comes out of redundant, competitive research," the disadvantage of the inhibition of competition seems to be keenly felt by researchers. Researchers' apprehensions notwithstanding, the principle underlying the current research policy seems to be placing too much emphasis on excluding, in the first place, the probability of research competition arising between several researchers or between research groups.

To the question in the Questionnaire, "If an increase in funding were to be granted now, what is the item that you would most like to see improved?" a majority of the respondents (51 percent) ranked "a raise in per-capita unit research expenditure" first. This may be interpreted as reflecting the desires of the directors of government laboratories that, when it comes to selecting concrete research themes, the power to decide be left with the researchers themselves.

"The most important thing for a researcher is to come upon a good research theme," opined a lecturer. What this remark probably suggests is that, as things stand now, researchers at government laboratories are too preoccupied with meeting the requirements of government to have the mental breathing space that would enable them to look for a good research theme. On this point, it is probably necessary for the administrators first to have this mental breathing space. Then the researchers in turn would, for the first time, acquire their own freedom of thought.

Furthermore, an adverse effect of the aforementioned practice—breaking down research themes into their finer subdivisions—also was pointed out: An increase in the number of research themes begets an increase in the number of related chores, such as clerical work for clearing regulations.

The excessive rigidity with which adherence to regulatory procedures is pursued was cited as an example of imposing unnecessary limitations on the freedom of research. Since government laboratories are government institutions, they are required to stick to regulatory procedures, even at the expense of work efficiency.

When it comes to the application of rules, no special consideration is given to the specific nature of operations in government laboratories, and they are treated in the same manner as other government organizations. In this regard, one lecturer cited the following example: "When a researcher belonging to a government office goes abroad on official business, he has to obtain an official-use passport. But to obtain the passport, he has to apply for it 40 days before departure." In contrast, for researchers in private businesses, it takes only about a week to obtain a passport. Furthermore, since the passport issued to researchers in private institutes are valid for 5 years, they do not have to obtain one each time they go abroad. Researchers in government laboratories, however, have to go through the necessary procedures to obtain an official-use passport each time they make a trip overseas. Because the travel expenses for public servants going abroad on official trips come out of the government coffer, officials are required to travel on an official-use passport. The imposition of such stringent restrictions seems to be having the effect of pouring cold water on the initiative of the researchers to conduct research.

As a measure to increase the level of freedom with which government researchers can undertake research on their own, there have been calls for increasing the authority of the laboratory directors. All directors, of course, are required to have management skills. But in this respect, someone argued that: "Only those persons who have fought a fierce battle in the forefront of research are qualified to become a director. Otherwise, they will not be able to give accurate support to basic research. And there must be in place a structure in which the director is fully responsible for the management of his research laboratory." Lacking a structure in which the director is empowered with considerable freedom and discretionary power with respect to the management of research, and, hence, with the authority to give his full blessing to basic research, we cannot expect any great advances in basic research.

3.4 Strengthening the Support Structure

A serious problem with the research structure in government laboratories is a deterioration in the research support sectors. The major cause is the across-the-board reductions in the strength of the government workforce. When cuts are planned, the segment of government workers to get the axe first have until now been people holding unattractive technical positions. This is giving rise to a contradiction in that technicians are essential to the conduct of research, but their posts are the first to be eliminated.

One lecturer identified the difficulty involved in according due treatment to talented technicians as a factor contributing to weakening the research support structure: "Technicians are in short supply. One of the causes is the lack of a system by which technicians can be appropriately rewarded (prestige and higher pay). To improve the treatment of technicians, and for the sake of

convenience, their positions frequently have been reclassified as research jobs. The result is that formerly ad hoc researchers have to be treated as full-fledged researchers, with their own research themes, and this serves to compound the contradiction still further."

Someone else offered the following observation: "The demand for new types of support, such as correcting grammatical errors in academic papers written in English and cartographic work, is increasing, but little is being done to cope with such needs."

Commenting on the weak research support structure in the government laboratories, one lecturer went as far as to say: "As things stand now, researchers are being forced to perform various chores while trying to carry out their research. Included among such tasks are filing budget requests, coordination with other departments, and maintenance of good relations with the local people, each of which requires a great deal of paper work. An environment should be established in which researchers can devote themselves to research."

3.5 Encouraging Competition

"Competition in the real meaning of the word is needed in order to invigorate research." "The world of research is a world where the law of the jungle prevails. Let them compete, and let only those who win (be they researchers or laboratories) be rewarded with funds for research. It is only natural that those who lose be liquidated." These are comments voiced by a lecturer who emphasized the severity of basic research and the importance of competition. However, the way in which government laboratories are being operated at present seems, as was related in connection with the discussion on limitations in the selection of research themes, to be heading in the opposite direction, i.e., avoidance of competition.

In creating a foundation for introducing competition into the world of research, an important precondition is that there be a framework within which individual researchers are evaluated for their work on the job, and the evaluations they have received are directly reflected in their treatment. A typical opinion is the following: "For the promotion of basic research, a change in the system is necessary. That is, the treatment (salary, promotion) of researchers engaged in basic research must be based on their abilities." The lack of an appropriate system for the evaluation of research abilities in government laboratories is illustrated by the following remark: "When the status of researchers as public servants is taken into account, their evaluation has to be perfunctory. If truly creative research is to be undertaken, it is absolutely necessary that we have in place a viable system for evaluating research talent."

As for the method of evaluation, various opinions were expressed: "The evaluation of researchers engaged in basic research should be based on their research achievements (such as ranking academic papers according to the fame and prestige the journals carrying those paper enjoy

around the world)." "There should be different evaluation standards for different fields of research. Development of large-scale systems and development of software, for example, have rarely been appreciated as academic achievements. But such breakthroughs have contributed greatly to the advance of science, and hence should be given the recognition they deserve."

3.6 Increasing Researcher Mobility

The merits of introducing fresh talent also were pointed out: "If they have to work face-to-face with the same individuals all the time, researchers feel a sort of mental isolation. For isolated researchers, the opportunity to come into contact with fresh and talented young researchers allows them to become mentally refreshed. And the group's performance gets a boost."

One lecturer made this observation: "Replacement of the old with the new has been made in the way talented researchers quit and seek employment in the outside world. One of the reasons why the recruitment of researchers from outside the office is not faring well is that researchers in the private sector are probably better paid than their counterparts in the government sector." This remark suggests that the real reason why the mobility of researchers in the government laboratories is not progressing as expected is the gap in pay between the government and private sectors.

The effectiveness of the "Post Doc" also was emphasized. "In ensuring the mobility of researchers, the Post Doc system is highly effective. The movement of personnel is possible only when there are vacancies in research posts. In the United States, graduates of graduate schools invariably become mobile researchers." To take full advantage of the ceiling in assigned research posts, filling every one of the posts with a researcher does not seem to be necessarily a desirable option. It seems that some slackness in the form of "vacancies" is needed. From the perspective of increasing the mobility of researchers, the following opinion was expressed: "We are expecting a great deal from the 'Basic Science Special Researchers System,' and the 'Science and Technology Special Researchers System,' both under the Science and Technology Agency, and these systems should be greatly expanded."

Regarding the prospects for improvement in the future, one lecturer stated: "The prospects for Japan are bright. This is because Japan at present is suffering from a shortage of manpower, and because young people are not necessarily adamant about holding life-long occupations. This is a God-given opportunity to increase the mobility of researchers." We are afraid, however, that with the situation as it is, heightened researcher mobility, if left unchanged and without any remedial measures, might have an adverse effect on government laboratories, such as defections of researchers to other organizations like private businesses. Consequently, while making efforts to increase the mobility of their researchers, government laboratories for their part will be required to make an

effort to transform their institutes into organizations that are highly attractive to researchers interested in basic research.

As described above, in government laboratories the replacement of old researchers with fresh talent from the outside is limited, and they are in effect forming closed societies. In this respect, they are being called upon to increase the flexibility of personnel assignments within their organizations with an eye toward increasing the mobility of their researchers. But the road to this goal, it seems, is strewn with obstacles.

For government laboratories, giving assignments to their senior researchers, in particular, seems to be a common headache. At the seminars, the difficulty of finding proper assignments for senior researchers often was pointed out: "The latter half of a researcher's career is a big burden. Senior researchers could find an outlet in colleges and universities, for example, where they could teach." "Research specialists hardly ever receive appropriate treatment." What all this comes down to is that it is impossible to reward people who choose to become research specialists rather than seek management posts in the hierarchy with treatment appropriate to their experience and research capabilities. On this point, the researchers themselves, it is said, are partly to blame. That is, even those researchers who initially entered the world of research determined to dedicate their whole life to research begin, as they get older, to seek titles for themselves, i.e., management posts such as office chief and department chief. What lies behind this phenomenon is the tendency of society to regard people in management positions rather than the so-called specialists with much more esteem, and researchers allegedly have no choice but to go the way of management, out of consideration for their families, even if they wished to pursue careers as research specialists.

Another problem that also was pointed out is that for those senior researchers who are no longer suited for work in the front lines of research and who are also unsuited for management posts, the number of posts where their accumulation of research experience gained over many years can be put to good use is very small. One lecturer suggested a possible solution to these problems: "One way to treat older people, which is practiced in other countries, is to provide them with an impressive title, give them a private office, and provide them with a secretary."

If only from the perspective of ensuring internal flexibility in making personnel assignments, it is important for government laboratories to promote in parallel a broad range of research activities, ranging from basic research to applications and development research at the same laboratory.

According to our study of basic research in private business, the trend is toward undertaking basic research in a research institute or research organization separate from the applications research institute. The idea behind

this is that there should be a dividing line between basic research management and development research management. At the seminars, however, from the perspective of ensuring flexibility, particularly in personnel assignments, serious concerns were expressed over the wisdom of restricting government laboratories only to basic research.

For example, consider the following opinion: "Laboratories that are engaged in both basic research and applications or development research, in contrast to those doing only basic research, are going fine. This is because the former have an advantage in that they can easily transfer personnel from the basic research department to the applications department, or vice versa."

With regard to the question of shifting research fields as researchers grow older, the following opinion was expressed: "There are two types of research. One is research aimed at 'creating matter,' and the other is research aimed at investigating the nature of 'matter.' For people engaged in basic research aimed at investigating the nature of 'matter,' 40 years of age is the upper limit of their research life, and thereafter they should refocus their research somewhat toward applications. The reason is that creating 'matter' from an application-oriented perspective requires a lot of experience." Furthermore, the issue was discussed from the perspective of personnel management in laboratories: "Researchers that are too narrowly focused on basic research will have difficulty in finding employment in industry." According to another opinion: "Research needs sense. In this context, it is very useful if a laboratory has various functions within the same organization, because people change as they get older."

3.7 Strengthening Moral Support

Finally, "moral support" is also considered to be an important factor in promoting basic research. However, as can be seen from the remark "the atmosphere in government laboratories is not necessarily conducive to basic research," researchers seem to have few expectations regarding the promotion of basic research in the laboratories.

One lecturer described the atmosphere in his laboratory as follows: "It is like we are being told, 'if you have time to spend on basic research, why don't you do something of practical utility?'" And he underscored the need for moral support. Another lecturer had this to say about the atmosphere in his laboratory: "We are not told not to do basic research," but "in reality the way our laboratory is operated will not permit us to conduct basic research openly, so we are doing a little bit of basic research while looking over our shoulders."

Still another lecturer raised the issue of the lack of cooperation in research, as perceived by researchers, from management, who are ignorant of research: "The so-called planning division or administration division have been uncooperative with or ignorant of research." "They have been obstructing the progress of research by

coming up with various administrative regulations." "They may be thinking that they are implementing rational management, but their actions are creating frictions."

This lecturer sees the root cause of the problem thusly: The administrative divisions of government laboratories are staffed by people who have never worked in a laboratory before, and thus they have no clear-cut idea of what their laboratory is doing. Furthermore, these people are rotated at intervals of every 2 to 3 years. Unfamiliar with everything they see, these people can hardly be expected to commit themselves to giving active support to research lest they should make a big mess. In other words, the problem, as the lecturer sees it, is that the importance of promoting basic research has not been thoroughly drilled into the heads of the administrative division staff, and the testing and applications researchers. In essence, the lecturer's proposal is that "support specialists should be fostered in the support division."

4. Conclusion

4.1 Character of and Requirements for Basic Research in Government Laboratories

The way basic research should be conducted in government laboratories, as seen by the researchers at those institutions, can be summed up as follows:

- (1) Research operations centered on individual researchers.
- (2) Contribution to an increased accumulation of knowledge by mankind as a whole, not merely serving the interests of their parent administrative bodies.
- (3) Formation of a foundation for applications research.
- (4) Maintaining the high esteem accorded government laboratories in academic circles.

These concepts—research management centered on individuals; contributing to the cause of mankind, not merely serving the interests of their parent ministries and agencies; and contribution to heightened activity—are ideas alien to the way in which government laboratories have operated. However, from the speeches of the lecturers, we can see that, for the reasons described below, recognition that government laboratories must undertake basic research if they are going to evolve into research institutes with an emphasis on creativity is becoming a consensus among the researchers:

- (1) To facilitate the effective execution of applications and development research.
- (2) To gain recognition as advanced and prestigious "research institutes" at home and abroad.
- (3) To invigorate activity in the laboratories.

(4) To contribute to an increased accumulation of knowledge by mankind as a whole.

(5) To transform government laboratories into institutes that will be highly attractive to talented researchers.

(6) To ensure access to international research activities.

These items are all critically important if government laboratories are going to evolve into creative research laboratories. Thus, the promotion of basic research in government laboratories can be implemented only if there is a full understanding of what basic research really means.

However, as noted in paragraph 3.7, the remark that "the atmosphere in government laboratories is not necessarily conducive to basic research" also hits the mark. This seems to suggest that a full consensus has yet to emerge among the parties concerned, from the center to the field, about the need for conducting basic research in government laboratories, and that different people hold different ideas about the prospects for basic research.

Government laboratories are institutions with diversified roles and characters, so it is difficult to capture them with an across-the-board definition. It cannot be denied that this diversity makes it difficult for these institutions to fully grasp the meaning of and the need for undertaking basic research.

Government ministries and agencies need to take a new look at the character of basic research that the government laboratory concerned is being asked to conduct, and the reason why it is needed for each of the laboratories under their jurisdiction. It is also necessary that they seek to ensure that every one of the concerned laboratory people is well informed of the findings on matters on which a consensus has been obtained.

In particular, government ministries and agencies should take every opportunity to emphasize the following to those researchers engaged in basic research: The role of individuals in basic research is well appreciated. It is expected that researchers will work not merely for the interests of their parent government ministries and agencies, but also will seek to contribute to mankind's accumulation of knowledge. It is expected that they will provide the fundamental knowledge needed for applications and development research in their respective laboratories. And it is expected that they will contribute to the maintenance of activity in their affiliated research groups (to win high evaluations from academic circles, to enhance their appeal as a research group, and to maintain communications with leading researchers around the world).

It is expected that such efforts will contribute greatly to the cause of "moral support" described in paragraph 3.7, thereby greatly improving the morale of researchers engaged in basic research in government laboratories.

4.2 Measures To Improve the Management of Research in Government Laboratories

From the perspective of the government laboratories, the "points to be kept in mind in promoting basic research effectively in government laboratories" (see Section 3. "Points To Be Kept in Mind in Promoting Basic Research Effectively in Government Laboratories, and Obstacles") can be summed up as follows:

- (1) Securing talented researchers suited to basic research.
- (2) Increased funding for basic research and increased flexibility in how the money is used.
- (3) Increasing the discretionary power of the people actually engaged in research.
- (4) Strengthening the support sectors.
- (5) Encouraging competition.
- (6) Increasing the mobility of researchers.
- (7) Strengthening moral support.

However, as described in Section 3, the way in which government laboratories have been operated presents problems with respect to each of these points, and it can hardly be said that basic research in government laboratories is progressing smoothly.

Since the activities of government laboratories are a matter of great importance from the perspective of formulating the science and technology policy of Japan, the CST and other bodies have continued to study ways to improve the operation of the laboratories. Of all these studies, CST report No. 13 is considered the most comprehensive and authoritative.

CST report No. 13 deals primarily with basic research, and it addresses most of the issues raised in our series of seminars. Since publication of the report, great efforts have been made to improve the way in which government laboratories are operated, but the current series of seminars indicates that there is still room for improvement.

In addition to the problems of personnel and money for research, the issues that were stressed most emphatically in the current series of seminars were increased flexibility in research conditions, beginning with increased discretionary power in the hands of people at the forefront of research, and beefing up the research support structure. CST report No. 13 calls for flexibility in the management of research-related personnel, budgets, and organizations. But little improvement, it seems, has been made in these areas.

In discussing the importance of research support structures, the grave situation in which research support currently finds itself was given great emphasis. Beefing up research support capabilities was called for in the CST report No. 13, but in the current series of seminars

the importance of securing personnel for research support, among others, was emphasized.

In the current series of seminars, the need to strengthen moral support again was pointed out, this in addition to discussions in past meetings. It seems that the issue of how to get clerical workers to understand things concerning basic research, among others, has yet to be studied.

After taking into account the opinions of researchers at government laboratories, as described above, the authors would like to put forward several additional proposals for studies on measures to improve the management of research as a way to promote basic research in government laboratories.

(1) Management of Research Under the Leadership of a Talented Research Leader

In the current series of seminars, a number of lecturers pointed to research management centered on individuals, a system in which talented researchers are recruited and then given full freedom to conduct research, as the key to the promotion of basic research in government laboratories. However, in government laboratories that have dedicated missions, the freedom with which individuals can act on their own can hardly be without bounds.

Therefore, for government laboratories, the key to managing these institutions in the future involves establishing a synergy between institutional management centered on individuals, which has numerous advantages, with the overall mission of the laboratory. The key to adjusting the two lies in finding a research leader with superb leadership qualities. In other words, how well government laboratories will fare in the future will depend on whether an institution has talented research leaders who, while fully cognizant of the overall mission of their organization, are able to maintain, without suppressing the free initiative of the researchers under their supervision, a research management system centered on individuals in which the research programs pursued by the researchers coalesce with the goals of the institution as a whole.

To that end, the problem to be addressed is how to introduce into government laboratories a decisive elite hierarchal structure where talented research leaders can display their leadership to the fullest.

(2) Creating a Competitive Atmosphere by Increasing Researcher Mobility

Competition among researchers, an idea which was identified as one of the incentives for promoting basic research in government laboratories, is inconsistent with the philosophy of Japanese government laboratories. Thus it is hard to see how the idea of competition can be introduced into the frontline of research unless research organizations drastically change their nature.

It is believed that the lack of researcher mobility is the primary reason why competition among researchers is not progressing smoothly. It is easy to understand that in a situation where researchers do not migrate from one position to another as a way of advancement, introducing the principle of competition on a grand scale, however ideal it may be, would entail great difficulty.

Consequently, as a precondition for accelerating the introduction of competition, it would be necessary to increase the mobility of researchers in government laboratories. The existing system of employment for life has an advantage in that it enables researchers to pursue a research theme on a long-term basis. Therefore, rather than overturning the existing system overnight, creating a system where the ranks of hired-for-life government laboratory researchers are interspersed with large numbers of mobile researchers might pave the way for a smooth introduction of "competition among researchers" into government laboratories.

(3) Large Increases in Pro Rata Allocation of Research Money

An effective way to expand freedom of research at the forefront of research would be to increase the amount of pro rata research money drastically. In response to a question in the Questionnaire, which asked the respondents to identify those items on the list for which budget increases were most desired, an "increase in the unit price of per capita research expenditure" was listed as the highest priority. This suggests that there is an urgent need to increase per capita research expenditures.

The pro rata amount of research money was frozen for a long time because of the severe budgetary situation, but small increases have recently been made (¥ 1.46 million for the Experiment System I and ¥ 1.28 million for the Experiment System II in the budget for FY1991). However, according to the results of the survey, an average of ¥ 10.4 million per researcher reportedly is needed to conduct a full-fledged research project, and it may be that the current levels of per capita funding for research are far from satisfactory. For an increase in the freedom of research to truly take effect at the forefront of the work, the pro rata amount of research money would have to be increased to a level where the funding can cover most research needs, although a balance must be struck between that amount and the cost of the project. Also, the laboratory director would have to be given sufficient discretionary power to enable him to manage funding in a flexible manner in order to execute the research most effectively.

An increase in the discretionary power of the people at the forefront of research would have to be accompanied by a structure that would make it possible for outsiders

to evaluate the research achievements of the government laboratories. But, once merit-based management of government laboratories has been established, research efficiency would be increased greatly if the discretionary power to determine how the research money appropriated for the government laboratories will be used were left to the researchers themselves, accompanied by great increases in the pro rata amount of research money.

(4) Trial Operation of a Flexible Research Budget

To increase the flexibility with which research funds are used (diverting an appropriation for one research theme to use for another, carrying over funds from one year to the next) the authors would like to propose the trial operation of a new method of managing research funds as a prelude to conducting long-term studies on the problem. Under the new system, a pool of research money (special testing and research funds) is set up at the center. Given certain limitations, there would be enough flexibility to divert money between various research themes or to carry money over from one year to the next. Also, funds would be apportioned among the government laboratories, which the laboratory director can use for any research purposes he considers necessary for his laboratory.

(5) Treatment of the Research Support Staff

In order to provide technicians at government laboratories with rewards worthy of them, the authors propose the following idea: Let these individuals be classified as administrative specialists ("technical officials" or "technical specialists") as are examiners at the Patent Office, and let them be rewarded much more generously than researchers (for example, paying higher salaries or extending the mandatory retirement age, but with no allowance for research expenses). Also, qualified researchers should be encouraged to switch from a research to an administrative specialist position.

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Reference Paper No. 7

Research Environment in Government Laboratories

Results of a Survey of the Heads of National Research Organizations

With the cooperation of the Liaison Council of the Heads of National Research Organizations Under the Direct Supervision of Government Ministries and Agencies (hereafter, Liaison Council), the NISTEP, STA, investigated the research environment in government laboratories in May of this year. This investigation centered on financial affairs.

Outline of the Survey

All 93 heads of national research organizations belonging to the Liaison Council were targeted for surveying in the questionnaire. Of these, 87, or 94 percent, responded. The 87 respondents were classified into three broad categories according to the major research activities being undertaken in their laboratories:

Thirty-four respondents (or 39 percent) fell into the category of "Experimenting in scientific and engineering fields"; 28 (32 percent) came under "Experimenting in biological and medical fields"; and 25 (29 percent) were

from fields other than these two, hereafter called "Humanities and social studies."

1. Ideals of Government Laboratories and Their Problems

The questionnaire solicited the opinions of the heads of government laboratories on the ideals and roles of government laboratories, the current research environment, and the effects of this environment on research.

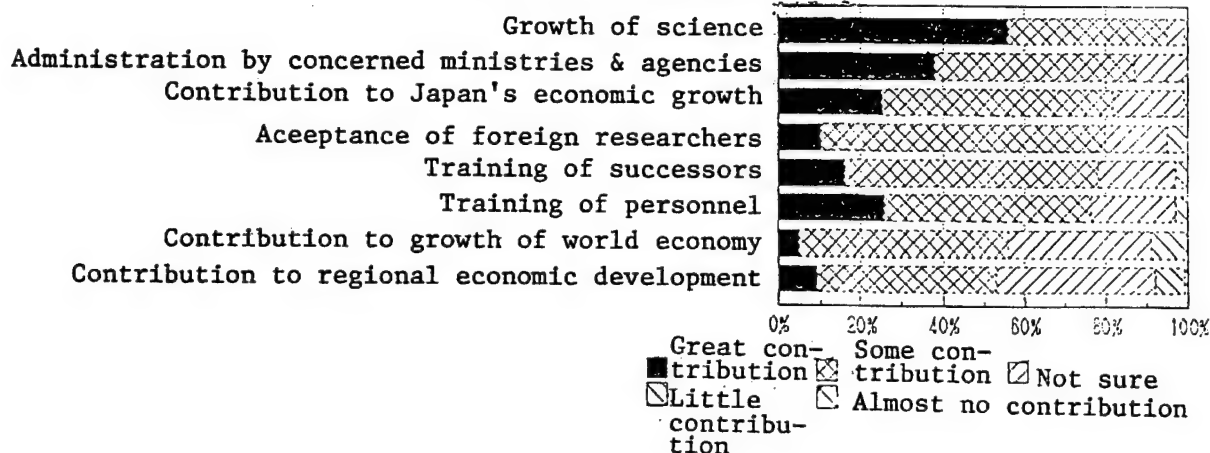
Roles Played by Government Laboratories

Strong confidence in their contributions to the "growth of science" and the "execution of administrative business by their parent ministries and agencies."

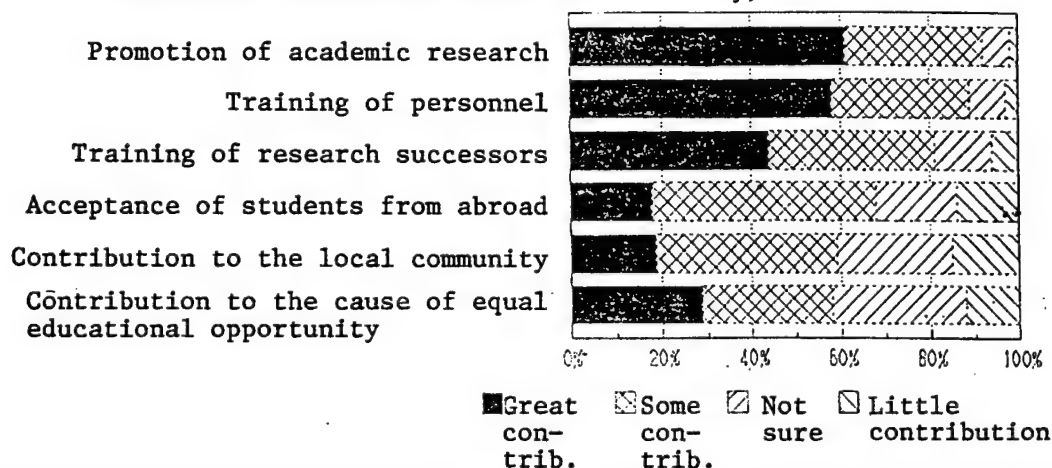
The respondents generally gave high marks to government laboratories for their contribution to society as a whole. A majority replied that government laboratories have been making especially great contributions to the "growth of science" and to the "execution of administrative business by their parent ministries and agencies."

When the results are compared with those of the "Survey by the Association of National Universities" (hereafter, National Universities Association Survey), fewer respondents cited a "great contribution" to "training of personnel in various fields" or to "training of successors in research."

Roles of Government Laboratories



Roles of National Universities (National Universities Association Survey)



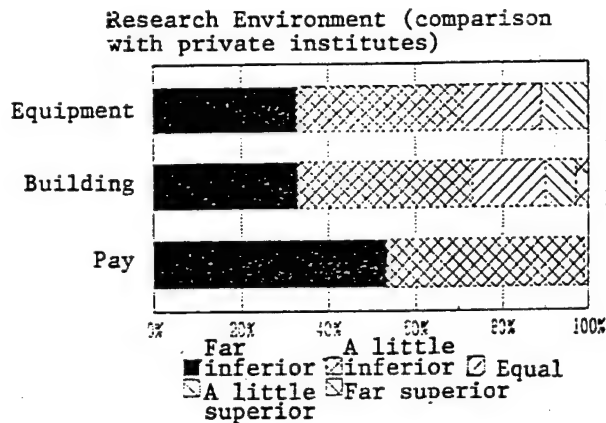
Research Environment and Research Standards

Compared to the private sector, the research environment in government laboratories is inferior with respect to research facilities and equipment, buildings and pay, and their standards of research also will decline in the future.

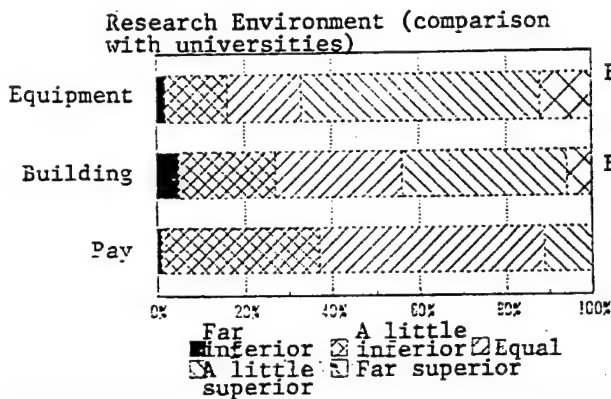
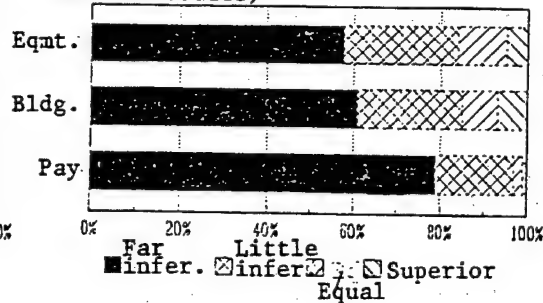
Regarding the research facilities and equipment at government laboratories, 55 percent of the respondents replied that they are "a little superior" to those in the universities, but when a comparison was made with similar facilities and equipment in private research institutes, 38 percent said that they are "a little inferior," while 33 percent replied that they are "far inferior." Regarding pay, a majority (52 percent) replied that their salaries were roughly on a par with those paid to university workers. In a comparison with salaries in private research institutes, 53 percent replied that our salaries are "much smaller," while 45 percent replied "a little smaller."

The heads of government laboratories believe they are a little better off than their counterparts in the universities in terms of equipment and buildings, but are in worse shape when compared to their counterparts in private research institutes. Regarding pay, government laboratory workers are receiving about the same salaries as university workers, but are paid far less than their counterparts in private research institutes.

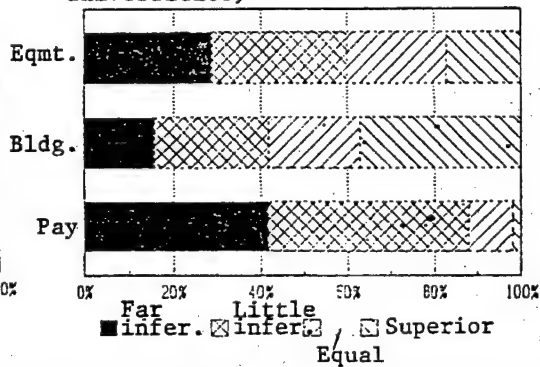
With regard to the levels of research in government laboratories, 45 percent of the respondents replied that "our research levels are about the same as those in the universities," while 42 percent replied that "our research levels are a little ahead of those in the universities." Regarding prospects for 10 years from now, similar trends are observed but are much more diversified. In a comparison with private research institutes, a plurality (40 percent) replied that "we are a little ahead of private



[National Universities Association Survey]
Research Environment
(Comparison with private businesses and institutes)



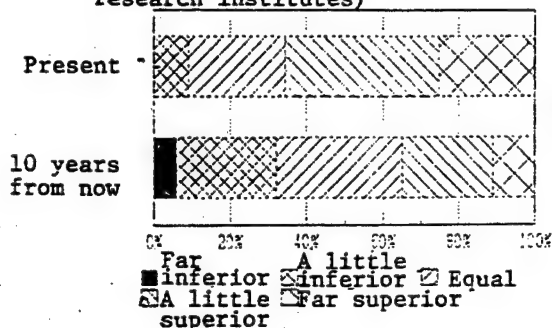
(Comparison with private universities)



institutes," but as for prospects for 10 years from now, 33 percent replied, "We will be at about the same levels as private institutes are." Meanwhile, 26 percent replied,

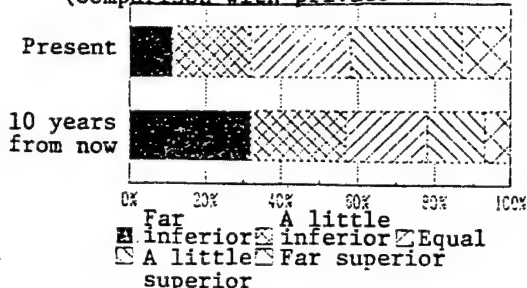
"We will be a little lagging behind private institutes." All this indicates that government laboratory directors are pessimistic about the future of their institutions.

Research Standards at Present and 10 Years From Now
(Comparison with private research institutes)

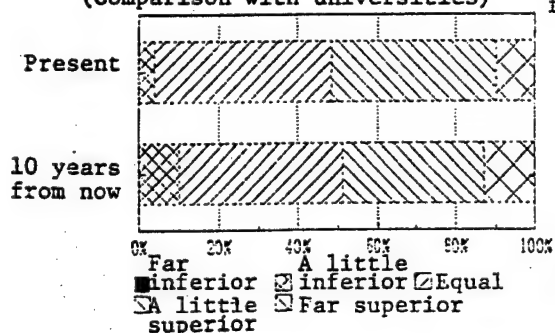


[National Universities Association Survey]

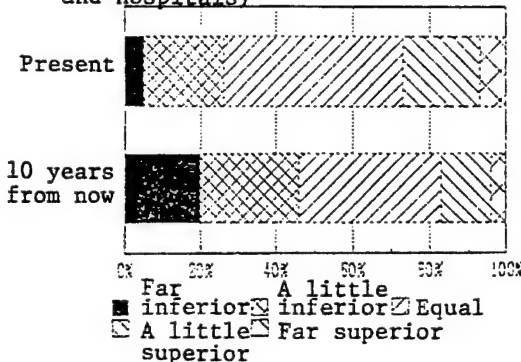
Research Standards at Present and 10 Years From Now
(Comparison with private research institutes)



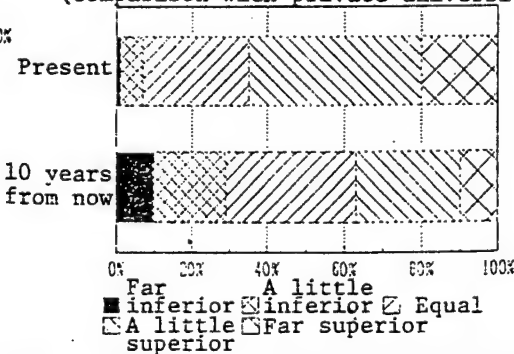
Research Standards at Present and 10 Years From Now
(Comparison with universities)



(Comparison with government labs and hospitals)



(Comparison with private universities)

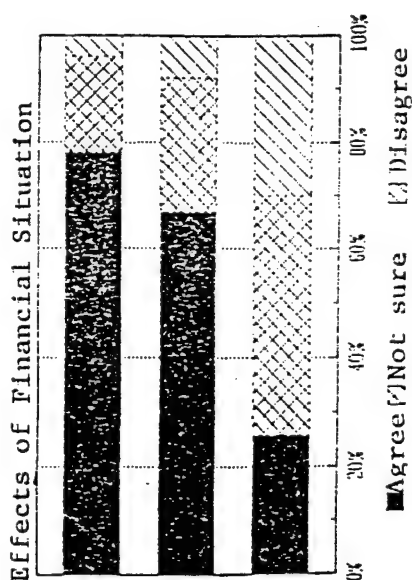


Effects of Financial Conditions on Research Activities

A feeling of crisis over the prospect of securing talented researchers.

A great majority (79 percent) of the respondents agreed with the opinion that "Talented researchers are

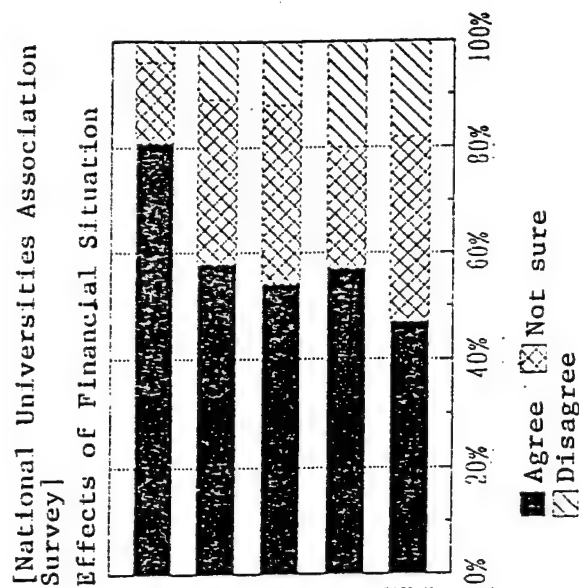
unwilling to work in government laboratories because of the poor treatment and inferior research conditions there," thereby revealing the crisis mentality among laboratory heads over the prospects for securing talented researchers given the existing treatment and research conditions.



Talented researchers are unwilling to work in government laboratories because of poor treatment and inferior research conditions.

Abilities of government laboratory researchers are not being exploited to their fullest potential because of restrictions on research money and equipment.

Because government laboratories are lagging behind private businesses in advanced fields of research, they are having difficulty in terms of domestic and international research exchanges.



Abilities of teachers at national universities are not being exploited to their fullest potential because of restrictions on routine expenses such as research money and equipment.

Talented teachers are unwilling to work in national universities because of poor treatment and inferior research conditions.

Because universities are lagging behind private businesses in advanced fields of research, they are having difficulty in terms of domestic and international research exchanges.

Because of tuition hikes and dilapidated buildings, gifted students are losing faith in national universities.

This is giving rise to problems in terms of an equal opportunity to receive education and to invigorate local communities.

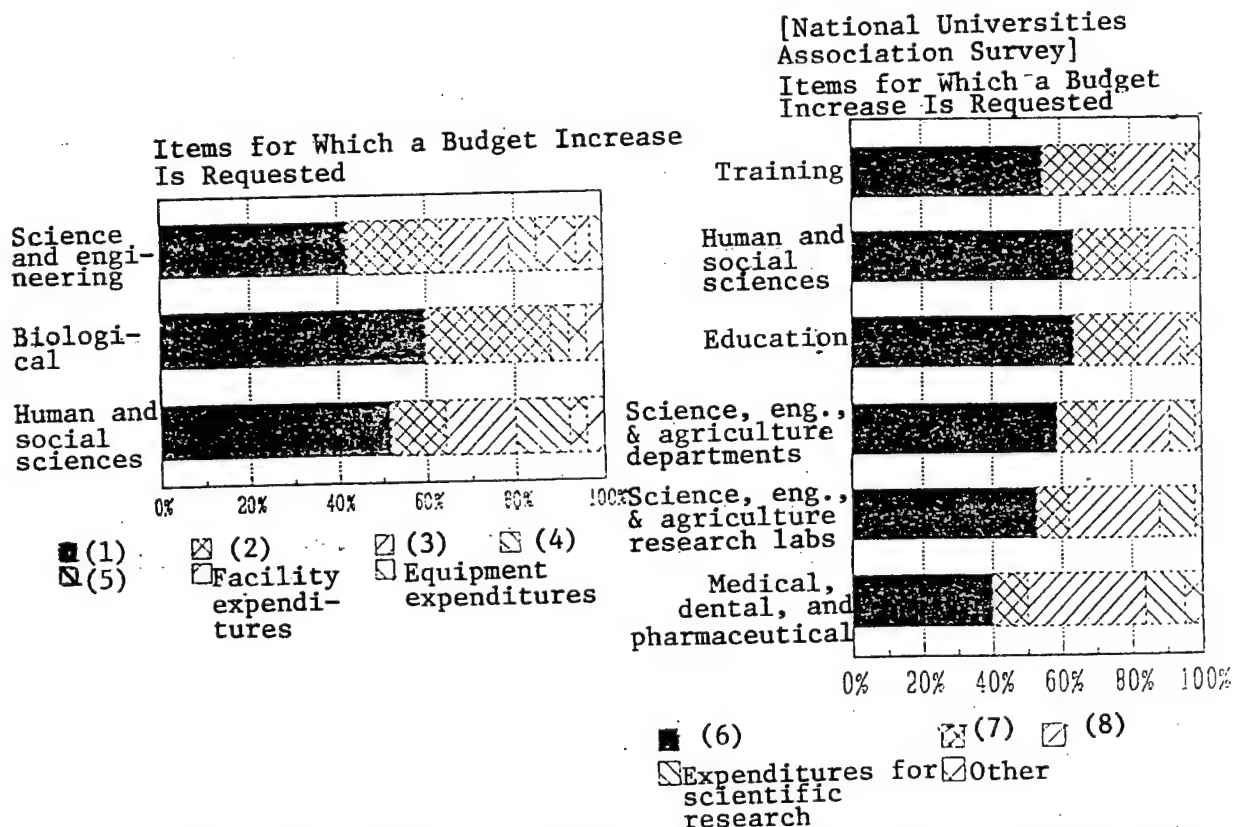
2. Opinions on How To Improve

Research Expenditures

A big increase in per capita research money and flexibility in the use of budgets requested strongly.

An increase in research budgets is being strongly requested. Not a single respondent said there is no need to improve current budgets.

Among the items needing improvement that ranked at the top of the priority list were "an increase in the unit cost of per capita research expenditures" (51 percent), and "an increase in the total sum of expenditures for research" (21 percent). In the biological system in particular, 61 percent of the government laboratory directors cited an increase in per capita research expenditure as their first priority. Coming in second and third were "an increase in expenditures for travel in Japan" (24 percent), and "an increase in expenditures for travel abroad" (19 percent).



The next question centered on problems that may exist with respect to how money is spent. An overwhelmingly large number of respondents indicated that, "It is not permitted to divert money for experiments and research to cover travel expenses, and vice versa" (65 percent). Others complained that, "Appropriations in the budget

cannot be carried over from one year to the next" (24 percent). For biology laboratories in particular, the corresponding figures are 82 percent and 15 percent. This suggests there is a strong desire for a mechanism that would make it possible for funds to be diverted from one research purpose to another.

Desired Improvements With Respect to Use of Budgets (Percent)

	Science and engineering laboratories	Biological laboratories	Human and social sciences laboratories
Diversion of money between test and research expenses and traveling expenses	52	81	67
Diversion of money from one year to the next	39	15	13
Diversion of money between travel expenses for the staff and overseas travel expenses	6	4	8
Diversion of money between test and research expenses and expenses for leasing of computers and dedicated communications equipment	3	0	8
No problems	0	0	4
Total	100	100	100

[National Universities Association Survey] Desired Improvements With Respect to Use of Budgets (Percent)

	Human and social sciences departments	Science, engineering, and agricultural departments
Diversion of money between school expenses and travel expenses	60	50
Diversion of money from one year to the next	21	31
Diversion of money between various school expenses	15	15
No problems	4	4
Total	100	100

Research Expenses Paid Out of Pocket

Research expenses are borne by the researchers themselves at many laboratories.

One question asked: "Have you ever paid part of the expenses for your research project out of your own pocket during the past year because of the shortage of research money?" Of the respondents, 83 percent replied "yes" in the case of expenses for travel in Japan, and the figure went up to 90 percent in the case of travel abroad. Regarding the acquisition of books and magazines, 86 percent of the directors replied that their researchers financed part of such purchases with their own money.

Amount of Research Money Needed Per Researcher

An average of ¥290,000 is needed for travel in Japan.

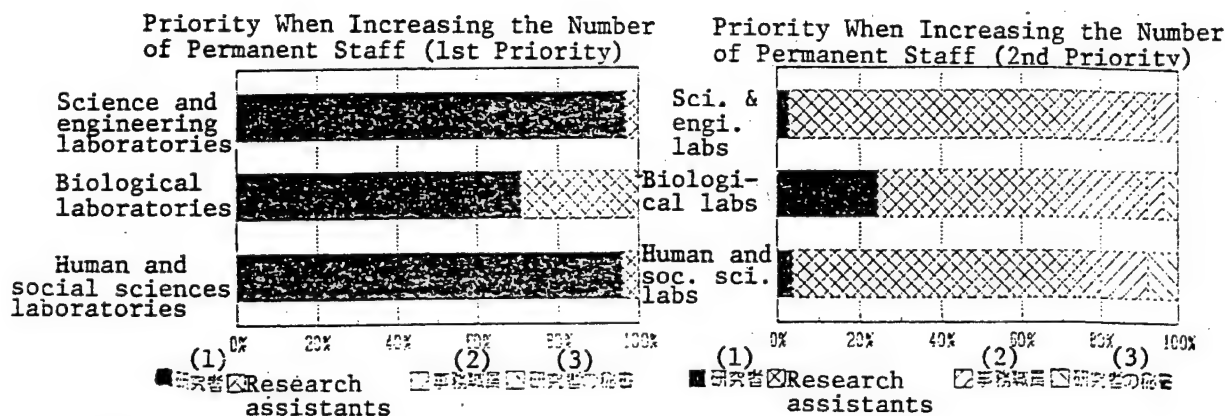
To the question, "If researchers are to conduct their research faithfully, how much research money, do you think, will have to be expended per researcher or research group?" the average figure per researcher given by the directors was ¥290,000 for travel in Japan, ¥990,000 for travel abroad, and ¥10.4 million for testing and research.

Depending on the particular type of research in which a laboratory is engaged, the sum of money allegedly needed for research varied from ¥250,000 for the "science and engineering laboratories" to ¥300,000 for the "biology laboratories" to ¥340,000 for the "human and social science laboratories" in the case of travel in Japan, while the sums requested were ¥870,000, ¥1,060,000, and ¥1,090,000, respectively for overseas travel.

Priority Placed on Increases in the Number of Permanent Staff

Increased number of researchers is first priority.

Regarding an increase in the number of permanent staff, an overwhelming majority (88 percent) cited "an increase in the number of researchers" as their first priority. Seventy-nine percent listed "an increase in the number of research assistants and technicians" as their second priority. Depending on the type of research in which the laboratory was engaged, 29 percent of the heads of "biology laboratories" cited "an increase in the number of research assistants and technicians" as their first priority. This stands in sharp contrast to "science and engineering laboratories" (3 percent) and the "human and social science laboratories" (4 percent).



Key: 1. Researchers; 2. Administrative workers; 3. Secretaries for researchers

Increased Introduction of Research Funds From Sources Outside Government Ministries and Agencies

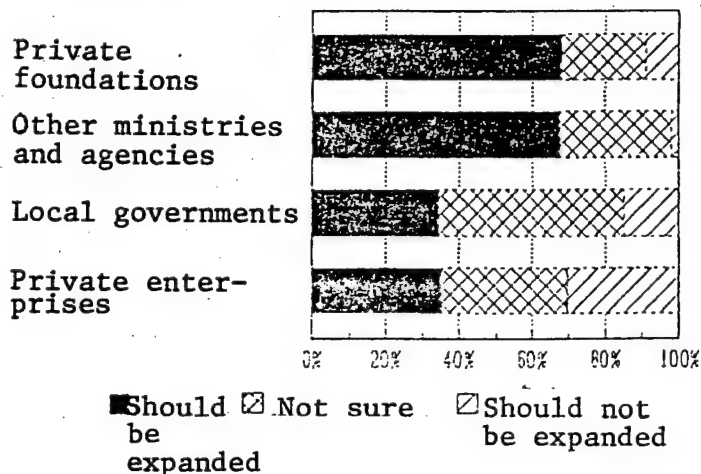
Much is expected from government ministries and agencies, and from private foundations.

Sixty-eight percent of the respondents were positive about "research funds from private foundations," while 67 percent were positive about "research funds from government ministries and agencies other than parent ministries and agencies." However, government laboratory directors seem less sanguine about any increase in

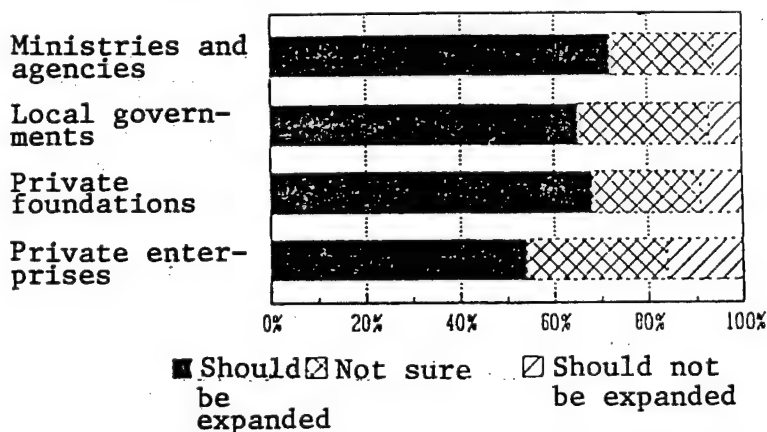
"research funds from private enterprises and individuals." This probably reflects their belief that the role of government laboratories is to conduct research for the general welfare of society, and that the achievements thus obtained should be put to good use in a broad range of activity beyond the framework of bureaucratic parochialism.

Compared with the results of the National Universities Association Survey, the government laboratories are taking a more cautious attitude toward the introduction of "research funds from private enterprises and individuals."

Introduction of Research Funds From
Government Ministries and Agencies
Other than One's Parent Ministry or
Agency



[National Universities Association Survey]
Requests for Research Subsidies From Sources
Other Than the Ministry of Education



**Flexibility in the Financial System and Diversified
Sources of Financing**

It was strongly requested that the system of financing be operated flexibly, and that sources of financing be diversified. As for expansion to fill gaps in terms of differences in research environments between research laboratories or between researchers that are duly expected to raise as a consequence, 65 percent of the laboratory

heads replied, "Efforts to promote flexibility and diversification should be pursued, even at the expense of an expanding gap." Another 34 percent replied, "I am still undecided about the pros and cons," while a mere 1 percent replied, "If the gap were to expand, efforts to promote flexibility and diversification should not be pursued." As a whole, there exists a strong desire to go ahead with efforts to increase flexibility in the management of the financial system, and to diversify the sources of financing.

About the Need for Efforts To Invigorate Laboratory Activities, and To Win Popular Understanding of Those Activities

A positive posture toward information disclosures and self-evaluation.

"Each government laboratory will examine its activities and come up with an overall scorecard" (84 percent). "The laboratory will make public its researchers' achievements" (84 percent). "Each laboratory will

actively disclose its research activities and its budgets as a part of maintaining good public relations" (81 percent). As these figures indicate, the respondents were positive toward information disclosures and evaluations of their activities by themselves. However, with the exception of the "biological laboratories," they were not so positive toward the idea of "Subjecting government laboratories to periodic evaluations by a third-party organization" (47 percent for the whole, and 61 percent for the biological laboratories).

Opinions on What Should Be Done To Invigorate Laboratory Activities and Win the Understanding of the People for These Activities (Percent)

	Total	Necessary	Not sure	Not necessary
Each laboratory should conduct comprehensive self-evaluations	100	84	15	1
Each laboratory should make public the achievements of its researchers	100	84	13	4
Each laboratory should actively disclose its activities and budgets for the sake of public relations	100	81	16	2
Each laboratory should subject itself to periodic evaluations by a third-party organization	100	47	41	12

[National Universities Association Survey] Opinions of What Should Be Done To Invigorate Laboratory Activities and Win the Understanding of the People for Those Activities (Percent)

	Total	Necessary	Not sure	Not necessary
Efforts should be made to improve the method of education, including an evaluation by students of the classroom work	100	59	27	14
Educational and research achievements of teachers should be made public to both faculty and students	100	63	26	11
Each university should disclose its activities for the sake of public relations	100	70	23	7
Each university should conduct comprehensive self-evaluations	100	56	30	14
Universities should be subjected to periodic evaluations by a third-party organization such as the University Standards Association	100	32	32	36

3. Space for Additional Comments

Many opinions were entered in the space for additional comments. Some of these are categorized and introduced below.

Understaffing

- Our laboratory at present is severely understaffed.
- Our staffing levels are insufficient to enable us to deal with the myriad of tasks that we are being asked to handle. On top of this, we are facing demands to reduce personnel.
- The worst nightmare that could hit us would be a reduction in the number of permanent staff. Across-the-board cuts based on ill-considered equality would imperil the future of Japan.
- If government laboratories are to display their capabilities fully, they will have to be exempt from the application of the "reductions in the number of permanent staff."

—Research tasks are increasing, but the number of researchers is not increasing. Thus we are being forced to cut down on the time we can devote to individual research projects. The result is that we are being forced to crimp on efforts to develop new methods and new fields.

—Without a large increase in the budget and a large increase in the staff for research (especially social sciences), we will be lagging further behind research levels in the other advanced countries.

—When embarking on a new project, there may be money to purchase equipment, but no money will be forthcoming to secure the necessary personnel (an increase in the size of the staff). The result is that the value of the project is diluted. It may be time to initiate studies on how to establish rules for personnel assignment that are appropriate to the scale of the research project.

—As for the research structure, the minimum requirement is a three-man team, consisting of a research

chief, a researcher, and a research assistant. Three-man teams account for 60 percent of the research groups in our laboratory. If further personnel reductions were to occur, they would have a sharply adverse effect on our research structure.

Flexibility in the Personnel Management System

- The methods by which workers are ranked and promoted are being implemented too starkly and rigidly. As things stand now, whether a person is accredited with a higher rating, and consequently gets a promotion or not, is being determined strictly on the basis of such factors as qualifications, school career, seniority, and the number of achievements (quality is not much of an issue). I think it is about time, as is widely practiced in Europe and the United States, for greater weight to be given to the recommendation of his senior. Or, if a person has won a high evaluation from an academic society, university, or research organization in some other country, this also should be taken into consideration. The way in which the personnel management system is being operated is too rigid, mechanical, strict, and formal. With the situation as it is, I am afraid gifted young people may be disheartened.
- Because government ministries and agencies, and government laboratories operate with fixed staff levels, they would encounter great difficulty if they tried to invite outside people (in the form of guest workers) to work with their staff, to effect personnel exchanges, or to undertake interdisciplinary research projects. There is a desire to remove these barriers from the regular staff so that local government workers and people in the private sector can be invited as needed to promote personnel exchanges.
- Given the manner in which university teachers under the jurisdiction of the Ministry of Education, Science and Culture are taking advantage of the "Special Law Pertaining to Educational Public Servants," I think it is about time for us to have our own special legislation enacted, something like a special law on public servants engaged in research. I don't think the existing "Research Exchange Promotion Law" is a sufficiently powerful vehicle. Since mandatory retirement at age 60 has been instituted, more mid-level and young researchers, I believe, are beginning to opt for universities over government laboratories as a place of employment.
- Government laboratories must recruit students with advanced levels of professional knowledge and talent. In this context, I believe, the selective hiring system is an excellent system. However, such restrictions as limiting the number of students who can be recruited from the general public in an open examination to only a fraction of the total number of students who are going to be hired for the year, or employing students according to a rigid framework in which the number of students needed in what specific fields of research is firmly specified when drafting the recruiting plan are a hindrance to proper employment of the aspiring researchers. To improve this situation, I believe, the operation of the selective hiring system should be improved so that the best opportunities

for employment would be offered not only to aspiring students but also to other laboratories.

- Personnel management is being implemented too rigidly, which is hampering the effective utilization of talent.

How To Secure Researchers

- It is thought that the special researchers at the Science and Technology Agency contribute to the promotion of research activity. However, since these researchers are recruited in October, it is difficult to gather talented candidates. The hiring date for the class of researchers should be advanced to April, the month when students fresh from school join the work force.
- Increasing numbers of students have been shunning government jobs in recent years, and the number of students who take the examination for the Class I government officials has been dropping sharply even among students at the national universities, which until now have been the primary source of candidates for government jobs. Recently, the desire of graduates to find work in the regions from which they hail has been growing stronger, but the greatest cause for the sharp drop is believed to be the big gap in pay between government researchers and their counterparts in big private businesses (to include the cost of living away from the family)—although government laboratories have advantages over private research institutes in terms of greater freedom in selecting one's research theme, etc. It would be necessary to improve the allure of government laboratories in terms of material benefits.
- If government laboratories are to become attractive places for young people, they will have to be operated under a management system in which the laboratory head is granted a high level of discretionary power that enables him to apportion research funding for unique and creative research projects, especially the creative ideas of young researchers. This is not impossible even now, but apportioning a small sum of research money to some specific research program has its limits. Great increases in funding for research, especially appropriations for routine research expenses, are awaited.
- Housing for researchers is poor, and research buildings are inadequately furnished. Improvements are needed in these areas to be able to attract talented researchers.

Flexibility in the Budget and Accounting System

- In conducting research in the social sciences, interview surveys, including questionnaire surveys, are critical. These activities require a lot of manpower, or they must be commissioned to outside organizations. Current research expenses, and the unit cost of work as determined by the ministry or agency, are insufficient to cover such costs. As a result, research efficiency suffers heavily.

- Research activities that require a liaison with foreign countries have increased greatly. Consequently, the demand for personnel who can handle purely secretarial tasks is growing, but the limitations inherent in the existing system, such as the unit cost of work, etc., do not allow for such personnel.
- An increase in the discretionary power of the laboratory head (diversion of research funding among projects), and utilization of the leasing system.
- (Regarding expenditures for travel overseas) it is necessary to search for ways to "drastically lessen the application" of existing regulations pertaining to accounting and dispensing methods for travel expenses. For example, studies are needed on ways to make it possible for such decisions as (a) changes in destination, and (b) the final power to determine how much money is necessary for a particular destination will be left to the laboratory director.
- The reality is that an increase in research commissions from private businesses tends to suppress funding for other research projects, because of the ceiling on the budget. It would be necessary to treat commissioned work as something outside the framework of the budget ceiling.

Problems Associated With Research Exchanges, Such as the Dearth of Travel Expenses

- In my field of research, an international conference is held once every 5 years. As director of the laboratory, I am duly expected to attend the meeting. I should be representing Japan at the conference, but there is no financial allowance for the trip in our accounting system. Funding for the trip should be appropriated in the budget.
- Although small in absolute terms when compared to large-scale facilities and equipment, shortages of funds for travel in Japan and abroad are serious, and great increases in travel allowances are urgently awaited.
- As the economy of Japan has expanded in recent years, we have been receiving increasing numbers of requests for participation in academic meetings from foreign countries, but we have no funds at all that we can use to meet these requests.
- To meet the demands created by the growing trend toward internationalization, it is necessary to promote international research exchanges and technical cooperation, but because of the dearth of funding for travel overseas, we are finding it increasingly necessary to pay the costs of overseas trips out of our own pockets.
- When making an official trip by taking advantage of the Research Exchange Promotion Law, funding from government coffers is not always forthcoming, even for such basic matters as the registration fee for an international meeting.

- The budget for travel in Japan, such as to attend academic meetings, is lacking. A further increase in the budgetary framework could be achieved by taking advantage of the Coordination Funds for Promoting Science and Technology.

An Increase in the Budget for Basic Research

- Research is an activity without a scenario. Even when a scenario exists, if one follows it too faithfully, no creative results will be forthcoming. A great increase in the fundamental budget, to include funding for routine as well as special research, is necessary. Also, such an increase should be coupled with a great increase in the discretionary power of the government laboratory in matters relating to the budget.

Research Space

- Research space is determined based on the size of the permanent staff. As a result, if a government laboratory accepts a large number of researchers from abroad, its research environment will be seriously eroded, and the upshot will be that the poor research environment rather than the quality of the research itself will leave a strong impression in the mind of the foreign researcher, thereby greatly damaging the image of the laboratory and also of Japan.
- The lack of space in laboratory buildings is also a serious problem. The office space for researchers in nonexperimental and liberal arts laboratories is determined in accordance with that allotted for clerical workers in the administrative jobs category. However, no consideration is given to the fact that researchers must keep on hand several times as much literature as clerical workers. For researchers, working together in a big room has more disadvantages than advantages. The basic principle should be that researchers (professional researchers at least) are provided with their own space.

Renewal of Large-Scale Facilities and Equipment

- Organizations located in the Tsukuba Science City occupy facilities that were built more than 10 years ago. They are probably the most endowed of all government laboratories across the country. However, in the course of the more than 10 years that have elapsed since those organizations relocated there, many of the large-scale facilities and equipment have become old and outdated, and no money is to be found to renovate them.

Compilation of Statistical Data

- Statistical data prepared by central and prefectural government authorities provide basic research materials, and some types of information must be gathered on a continuing basis. Some types of research can be pursued only through the continual accumulation of such data. However, the organizations engaged in the compilation of such statistical data are being cut back

and weakened. If the gathering and accumulation of data are to be sustained on a perpetual basis, the setup requires better financial support. Many of the advanced countries are aggressively engaged in the collection and accumulation of information. If Japan continues to take statistical data lightly, we will find ourselves lagging behind in those research fields (including environmental problems) and we will become the target of increased criticism.

Systematization of "Research"

- 1) A system for conducting routine operations such as analyses of elements, etc., needs to be established (systematized).
- 2) A system for evaluating research results needs to be established.
- 3) Improvement needs to be made in the system by which a request for funding is made, and the budget is executed (introduction of a system similar to those used in the United States and Europe).

The common objective in all three of these requirements is the establishment of a research environment where research efficiency is elevated, and the creativity of individual researchers is displayed to the utmost.

Tasks Outside of Research Proper

- The paper work associated with filing a budget request or a request for an increase in staff (preparation of necessary documents and briefings) demands a great deal of time and energy. But the results of such exertion are minuscule. Thus it is a waste of a researcher's talent to have him heavily involved in such tasks.

Clarifying the Positioning of Government Laboratories

- The biggest problem is that the basic positions of ministries and agencies toward the government laboratories under their jurisdiction are unclear (or uncertain). Where government laboratories stand in the overall framework of governmental activity needs to be clarified. We should not expect an early improvement on the budgetary front, since the issue is closely related to the scale of Japan's total budget and budgetary policy. However, if we continue in the course in which the situation is evolving at present—keeping the organization intact but cutting the staff and the budget—the people working there will not be able to stand it any more. Once a decision has been made to invigorate a laboratory, there should follow a budget and staff commensurate with the effort. Instead, government laboratories that have lost their reason for being should be aggressively consolidated, and the researchers should be transferred.
- Researchers at government laboratories have attributes that are both similar and dissimilar to those of researchers at universities. Young researchers desire to work under a minimum of control so that

they will feel free to pursue their academic research and polish their abilities, as well as to increase exchanges with external educational institutions like graduate schools. Meanwhile, people in positions of research management are being asked to respond to administrative needs, and, at the same time, to lead those young researchers in correct directions. (This is not to say that those research managers need not be academically oriented. On the contrary, they should be academics of excellence so as to wield a great deal of influence in their respective fields.) In this context, government laboratory researchers should be offered research environments that are superior at least to those in universities.

- If government laboratories wish to carry out research that is really creative, touting their research prowess would have no meaning in the eyes of the world unless a comparison can be made with similar research organizations in other advanced countries. Japan is called an "economic power," but its government laboratories are lagging behind those of the advanced countries.

- In promoting research centered on young researchers, the consciousness of "government" is dissipating. In other words, the justification for the government laboratories is becoming blurred. I can understand why government laboratories are being asked to reorient their approach toward basic research, and we are redirecting our research accordingly. However, has the role of the government laboratories, which can best be represented by the term "promotion of industry," really come to an end? At a time when industry, the very foundation of our research, is wavering under the internationalization of industry, I think there is still a great need to fulfill industry's expectations.

- Changes in the global environment have created great problems in recent years. Such changes take place gradually over long periods of time. Thus, to be able to observe such phenomena, a survey and observation structure that allows for continued surveying and observation from a medium- to a long-term perspective is indispensable. Considering that the role of government laboratories lies precisely in the area of medium- to long-term research, it is necessary to establish a long-term budgetary system to underwrite these efforts, and also to ensure adequate personnel support.

Conclusion

Our survey was conducted in reference to an interim report prepared by the Survey and Research Committee on Financial Foundations of the National Universities of the National Universities Association entitled "The Status of Educational and Research Expenses for Teachers." However, in our survey the targets were the heads of government laboratories, while the National Universities Association survey was targeted at individual

teachers in the national universities. Thus one must pay attention to that point when comparing the two reports.

Our survey revealed that there has been a deterioration in the research environment in government laboratories. In the past, government laboratories played important roles, and their research standards were very high. As things stand now, they are lagging behind their counterparts in the private sector in terms of equipment, buildings, and pay. Thus we fear that there may have been a decline in their research standards. The salary gaps, in particular, seem to be a big factor, and we cannot help but feel anxious about their future. Many laboratory heads agreed with the statement that: "Because the treatment of researchers and research conditions are poor, government laboratories are having trouble recruiting talented researchers."

As for research expenses, it is no longer unusual for a researcher to cover shortages in the allocated budget with money out of his own pocket. It is important that the unit cost of research per researcher, and that allowances for travel in Japan and abroad be increased. Regarding the use of research money, regulations that prohibit the diversion of funds between research projects, and from carrying money over from one year to the next, are a problem.

As for the size of the permanent staff, an increase in the number of researchers is desired more than anything else. Next come increases in research assistants and

technicians. For researchers in the biological laboratories, however, an increase in the number of research assistants and technicians occupies first place on the priority list.

With regard to the question of diversifying the sources of research funds, government laboratories are enthusiastic about the possibility of expanding their sources to other government ministries and agencies, in addition to their own, and to private foundations. However, they are cautious about accepting money from private companies and individuals.

Finally, our survey was conducted as a joint effort by the Liaison Council of Directors of Government Laboratories and NISTEP. For inquiries and opinions, please contact the First Policy-Oriented Research Group, NISTEP.

Compilation of Survey Results

[Passage omitted]

2. Regarding the methods of research being used at your laboratory, pick out two of the most widely used from the methods listed below.

I. Ideals and Problems of Government Laboratories

(The following involves your opinions of the ideals and roles of government laboratories.)

3. What is your evaluation of the roles that government laboratories have been playing? Enter your opinion regarding government laboratories as a whole and your opinion of your laboratory by picking the appropriate numbers below.

	<input type="checkbox"/>	<input type="checkbox"/>
1. Literature research	2 (organizations)	5 (organizations)
2. Interviews, visits, questionnaires	6	5
3. Data analyses by computer	9	21
4. Theoretical research	4	6
5. Scientific and engineering tests	34	19
6. Biological and medical experiments	28	17
7. Others	4	12
Total	87 (organizations)	85 (organizations)

	1	2	3	4	5	
	Virtually no contribution	Slight contribution	Not sure	Some contribution	Great contribution	
						(Government laboratories as a whole) (Your laboratory)
a. Growth of science	<input type="checkbox"/>					(1) 0% (2) 1 (3) 4 (4) 39 (5) 56
						0% 7 7 36 51
b. Training of personnel in various fields	<input type="checkbox"/>					0% 3 21 51 26
						0% 7 14 45 34
c. Contribution to local economic development	<input type="checkbox"/>					1% 7 39 44 9
						11% 16 27 28 19
d. Training of research successors	<input type="checkbox"/>					0% 3 19 62 16
						0% 5 15 47 33
e. Acceptance of foreign researchers and international exchanges	<input type="checkbox"/>					0% 5 15 70 10
						3% 9 9 45 33
f. Administration of concerned ministries and agencies	<input type="checkbox"/>					0% 0 13 49 38
						0% 2 6 28 64
g. Contribution to Japan's economic growth	<input type="checkbox"/>					0% 1 17 56 25
						8% 5 20 49 17
h. Contribution to economic growth of the world including developing countries	<input type="checkbox"/>					0% 9 35 51 5
						15% 11 29 31 14

Note: Numbers in the Answer Column are ratios of answers belonging to each of the following answers -- (1) virtually no contribution through (5) great contribution -- to the total number of answers. The same applies to the following questions.

1	2	3	4	5	6
Far inferior	Somewhat inferior	About the same	Somewhat superior	Far superior	No basis for comparison
			(Pay)	(Equipment)	(Building)

a. Compared to universities	<input type="checkbox"/>	1% 36 52 11 0	<input type="checkbox"/>	2% 14 17 55 12	<input type="checkbox"/>	5% 22 29 38 6
b. Compared to private research laboratories	<input type="checkbox"/>	53% 45 1 0 0	<input type="checkbox"/>	33% 38 18 11 0	<input type="checkbox"/>	33% 40 17 7 3

4. How do you compare the research environment in your laboratory with those in universities and private research institutes? Regarding the levels of pay, research facilities, equipment, and buildings, enter your opinion by picking the appropriate numbers from the set of answers listed below.

5. Pick out the three most cumbersome restraints, in descending order, from the list of answers given below, that you think are hindering your research.

6. With respect to your laboratory's field of research, how do you rate the standards of research in government laboratories as against those in universities and private

	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1. Allowances for travel in Japan	13%	6%	24%
2. Allowances for travel abroad	14	9	18
3. Routine research expenses	29	38	3
4. Expenses for books and magazines	0	0	2
5. Expenses for facilities and equipment	5	22	15
6. Research space	5	3	8
7. Assistants in conducting research and experiments	34	20	28
8. Assistants who perform clerical work	1	2	1
Total	100%	100%	100%


(Present)	(10 years later)
1. $\frac{1}{2}$ of the original amount	1. $\frac{1}{4}$ of the original amount
2. $\frac{1}{4}$ of the original amount	2. $\frac{1}{8}$ of the original amount
3. $\frac{1}{8}$ of the original amount	3. $\frac{1}{16}$ of the original amount
4. $\frac{1}{16}$ of the original amount	4. $\frac{1}{32}$ of the original amount
5. $\frac{1}{32}$ of the original amount	5. $\frac{1}{64}$ of the original amount
6. $\frac{1}{64}$ of the original amount	6. $\frac{1}{128}$ of the original amount
7. $\frac{1}{128}$ of the original amount	7. $\frac{1}{256}$ of the original amount
8. $\frac{1}{256}$ of the original amount	8. $\frac{1}{512}$ of the original amount
9. $\frac{1}{512}$ of the original amount	9. $\frac{1}{1024}$ of the original amount
10. $\frac{1}{1024}$ of the original amount	10. $\frac{1}{2048}$ of the original amount
11. $\frac{1}{2048}$ of the original amount	11. $\frac{1}{4096}$ of the original amount
12. $\frac{1}{4096}$ of the original amount	12. $\frac{1}{8192}$ of the original amount
13. $\frac{1}{8192}$ of the original amount	13. $\frac{1}{16384}$ of the original amount
14. $\frac{1}{16384}$ of the original amount	14. $\frac{1}{32768}$ of the original amount
15. $\frac{1}{32768}$ of the original amount	15. $\frac{1}{65536}$ of the original amount
16. $\frac{1}{65536}$ of the original amount	16. $\frac{1}{131072}$ of the original amount
17. $\frac{1}{131072}$ of the original amount	17. $\frac{1}{262144}$ of the original amount
18. $\frac{1}{262144}$ of the original amount	18. $\frac{1}{524288}$ of the original amount
19. $\frac{1}{524288}$ of the original amount	19. $\frac{1}{1048576}$ of the original amount
20. $\frac{1}{1048576}$ of the original amount	20. $\frac{1}{2097152}$ of the original amount
21. $\frac{1}{2097152}$ of the original amount	21. $\frac{1}{4194304}$ of the original amount
22. $\frac{1}{4194304}$ of the original amount	22. $\frac{1}{8388608}$ of the original amount
23. $\frac{1}{8388608}$ of the original amount	23. $\frac{1}{16777216}$ of the original amount
24. $\frac{1}{16777216}$ of the original amount	24. $\frac{1}{33554432}$ of the original amount
25. $\frac{1}{33554432}$ of the original amount	25. $\frac{1}{67108864}$ of the original amount
26. $\frac{1}{67108864}$ of the original amount	26. $\frac{1}{134217728}$ of the original amount
27. $\frac{1}{134217728}$ of the original amount	27. $\frac{1}{268435456}$ of the original amount
28. $\frac{1}{268435456}$ of the original amount	28. $\frac{1}{536870912}$ of the original amount
29. $\frac{1}{536870912}$ of the original amount	29. $\frac{1}{1073741824}$ of the original amount
30. $\frac{1}{1073741824}$ of the original amount	30. $\frac{1}{2147483648}$ of the original amount
31. $\frac{1}{2147483648}$ of the original amount	31. $\frac{1}{4294967296}$ of the original amount
32. $\frac{1}{4294967296}$ of the original amount	32. $\frac{1}{8589934592}$ of the original amount
33. $\frac{1}{8589934592}$ of the original amount	33. $\frac{1}{17179869184}$ of the original amount
34. $\frac{1}{17179869184}$ of the original amount	34. $\frac{1}{34359738368}$ of the original amount
35. $\frac{1}{34359738368}$ of the original amount	35. $\frac{1}{68719476736}$ of the original amount
36. $\frac{1}{68719476736}$ of the original amount	36. $\frac{1}{137438953472}$ of the original amount
37. $\frac{1}{137438953472}$ of the original amount	37. $\frac{1}{274877906944}$ of the original amount
38. $\frac{1}{274877906944}$ of the original amount	38. $\frac{1}{549755813888}$ of the original amount
39. $\frac{1}{549755813888}$ of the original amount	39. $\frac{1}{1099511627776}$ of the original amount
40. $\frac{1}{1099511627776}$ of the original amount	40. $\frac{1}{2199023255552}$ of the original amount
41. $\frac{1}{2199023255552}$ of the original amount	41. $\frac{1}{4398046511104}$ of the original amount
42. $\frac{1}{4398046511104}$ of the original amount	42. $\frac{1}{8796093022208}$ of the original amount
43. $\frac{1}{8796093022208}$ of the original amount	43. $\frac{1}{17592186044416}$ of the original amount
44. $\frac{1}{17592186044416}$ of the original amount	44. $\frac{1}{35184372088832}$ of the original amount
45. $\frac{1}{35184372088832}$ of the original amount	45. $\frac{1}{70368744177664}$ of the original amount
46. $\frac{1}{70368744177664}$ of the original amount	46. $\frac{1}{140737488355328}$ of the original amount
47. $\frac{1}{140737488355328}$ of the original amount	47. $\frac{1}{281474976710656}$ of the original amount
48. $\frac{1}{281474976710656}$ of the original amount	48. $\frac{1}{562949953421312}$ of the original amount
49. $\frac{1}{562949953421312}$ of the original amount	49. $\frac{1}{1125899906842624}$ of the original amount
50. $\frac{1}{1125899906842624}$ of the original amount	50. $\frac{1}{2251799813685248}$ of the original amount
51. $\frac{1}{2251799813685248}$ of the original amount	51. $\frac{1}{4503599627370496}$ of the original amount
52. $\frac{1}{4503599627370496}$ of the original amount	52. $\frac{1}{9007199254740992}$ of the original amount
53. $\frac{1}{9007199254740992}$ of the original amount	53. $\frac{1}{18014398509481984}$ of the original amount
54. $\frac{1}{18014398509481984}$ of the original amount	54. $\frac{1}{36028797018963968}$ of the original amount
55. $\frac{1}{36028797018963968}$ of the original amount	55. $\frac{1}{72057594037927936}$ of the original amount
56. $\frac{1}{72057594037927936}$ of the original amount	56. $\frac{1}{144115188075855872}$ of the original amount
57. $\frac{1}{144115188075855872}$ of the original amount	57. $\frac{1}{288230376151711$

- | | | | |
|----------------------|----|----------------------|----|
| <input type="text"/> | 0% | <input type="text"/> | 0% |
| | 4 | | 10 |
| | 45 | | 41 |
| | 42 | | 36 |
| | 10 | | 13 |

- | | | | |
|--------------------------|----|--------------------------|----|
| <input type="checkbox"/> | 0% | <input type="checkbox"/> | 6% |
| | 9 | | 26 |
| | 25 | | 33 |
| | 40 | | 24 |
| | 25 | | 11 |

	Yes (percent)	No (percent)	Don't know (percent)
a. Expenses for travel in Japan	83	13	4
b. Expenses for travel abroad	90	8	3
c. Expenses for books and magazines	86	11	4
d. Others	55	6	39

7. The following are three opinions regarding the financial situations of government laboratories. Answer each of the following questions by picking a number from the following set of answers:



- | | | | |
|----|---|--------------------------|-----------------|
| a. | Because of limitations on appropriations for the costs of routine research and equipment, the talents of researchers at government laboratories are not being exploited to the fullest. | <input type="checkbox"/> | 8%
25
67 |
| b. | Because the treatment of researchers and research conditions are poor, talented researchers are unwilling to work in government laboratories. | <input type="checkbox"/> | 4%
18
79 |
| c. | Because government laboratories lag behind private enterprises in advanced research, they are finding it difficult to promote research exchanges in Japan and abroad. | <input type="checkbox"/> | 30%
44
26 |

┌───────────┴───────────┐		
1	2	3
I don't think so	I am not sure	I think so

- | | | |
|---|---|----------------|
| a. Because of the planned reduction in the number of permanent staff, the number of research assistants has been reduced, and this is preventing researchers in government laboratories from displaying their talents to the fullest. | <input style="width: 30px; height: 20px;" type="text"/> | 5%
8
87 |
| b. Because of the planned reduction in the number of permanent staff, a ceiling has been placed on new hires, with the result that it has become very difficult to recruit young researchers. | <input style="width: 30px; height: 20px;" type="text"/> | 5%
15
80 |

- | | | | | | |
|--|---|---|---|---|----------------------------------|
| a. Expenses for travel in Japan (figures above 99 are counted as 99) | <input style="width: 30px; height: 20px;" type="text"/> | <input style="width: 30px; height: 20px;" type="text"/> | ¥10,000
Average ¥290,000 | | |
| b. Expenses for travel abroad (figures above 999 are counted as 999) | <input style="width: 30px; height: 20px;" type="text"/> | <input style="width: 30px; height: 20px;" type="text"/> | <input style="width: 30px; height: 20px;" type="text"/> | ¥10,000
Average ¥990,000 | |
| c. Expenses for testing and research (to include the laboratory's maintenance cost) (figures above 9,999 are counted as 9,999) | <input style="width: 30px; height: 20px;" type="text"/> | <input style="width: 30px; height: 20px;" type="text"/> | <input style="width: 30px; height: 20px;" type="text"/> | <input style="width: 30px; height: 20px;" type="text"/> | ¥10,000
Average ¥10.4 million |

8. The following opinions have been expressed regarding planned reductions in the number of permanent staff in government laboratories. Answer each of the following questions by picking the appropriate number from the following set of answers:

II. Current Status of Research Expenses

(The next question involves research expenses in your laboratory.)

9. For the reason that research needed to be done but research money was lacking, have any of your laboratory people paid the expenses for any of the items listed below out of their own pocket in the past year?

10. Regarding the allocation of research money to individual researchers or groups of researchers,

assuming routine research is to continue smoothly at your laboratory, how much money per researcher will be needed over the course of 1 year?

11. When distributing research money at your laboratory, what is the minimum unit entitled to such an allocation?

- | | |
|--|---|
| | <input style="width: 30px; height: 20px;" type="text"/> |
| 1. Each researcher | 30% |
| 2. Each research laboratory, research group, section or subsection | 51 |
| 3. Each research department | 7 |
| 4. Others (describe in detail) | 12 |

III. Directions of Budget Improvement

(The next question is about ways to improve the budget situation in government laboratories.) 12. If an increase in funding is to be made, what improvements will need to be made? From the items listed below, pick two, the highest priority first and then the next highest priority.

13. With regard to the way in which government allocations are used by government laboratories at present, what are the problems, if any? Pick two, the highest priority first and then the next highest priority.

14. If an increase in the total number of personnel is to be made, which of the following categories will have the

highest priority? Pick two, the highest priority first and then the next highest priority, from the set of answers given below.

15. With regard to personnel management at government laboratories, what are the problems? Pick two answers, the highest priority first, and then the next highest priority, from the set of answers given below.

16. Should there be an expansion of research money from government ministries and agencies that are not your direct supervising organizations? Pick the appropriate numbers from the set of answers for each of the following questions.

	<input type="checkbox"/>	<input type="checkbox"/>
1. It is better to leave the situation as it is	0%	0%
2. An increase in unit research money per person	51	8
3. A hike in the allocation for equipment (less than ¥20 million)	1	7
4. A hike in the allocation for large equipment (above ¥20 million)	10	17
5. An increase in facility expenditures	3	10
6. An increase in funds for travel in Japan	6	24
7. An increase in funds for travel abroad	7	19
8. An increase in the total funding for research	21	14
Total	100%	100%

	<input type="checkbox"/>	<input type="checkbox"/>
1. There is no problem.	1%	0%
2. No diversion of funds between expenditures for research and testing, and for travel is allowed.	65	22
3. No diversion of funds between expenditures for research and testing, and for leasing computers or exclusive communications lines is allowed.	4	4
4. No diversion of funds between expenditures for travel by the staff and for travel abroad is allowed.	6	21
5. No diversion of funds from one year to the next is allowed.	24	54
Total	100%	100%

	<input type="checkbox"/>	<input type="checkbox"/>
1. Researchers	88%	10%
2. Research assistants and technicians	12	79
3. Clerical workers	0	7
4. Researchers' secretaries	0	3
Total	100%	100%

17. In one view, increasing the flexibility of the financial system and further diversifying of the sources of funds may deepen the gap in the research environment between research laboratories and researchers. What is your opinion on that?

18. One view holds that to expand government expenditures for government laboratories, it is necessary for the government laboratories themselves to revitalize their activities and to make efforts to win the people's understanding of them. In connection with this point of view, indicate your opinion on each of the questions below from a set of answers given below.

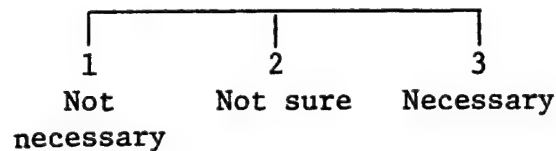
	<input type="checkbox"/>	<input type="checkbox"/>
1. There is no problem.	4%	1%
2. There is no way to give technicians the proper treatment due them.	36	25
3. There is no way to give devoted researchers the proper treatment due them.	39	30
4. There is no system whereby researchers not suited to a particular research project can be transferred amicably to other posts.	21	43
Total	100%	100%

1	2	3
The framework for the introduction of money should not be expanded	I'm not sure	The framework for the introduction of money should be expanded

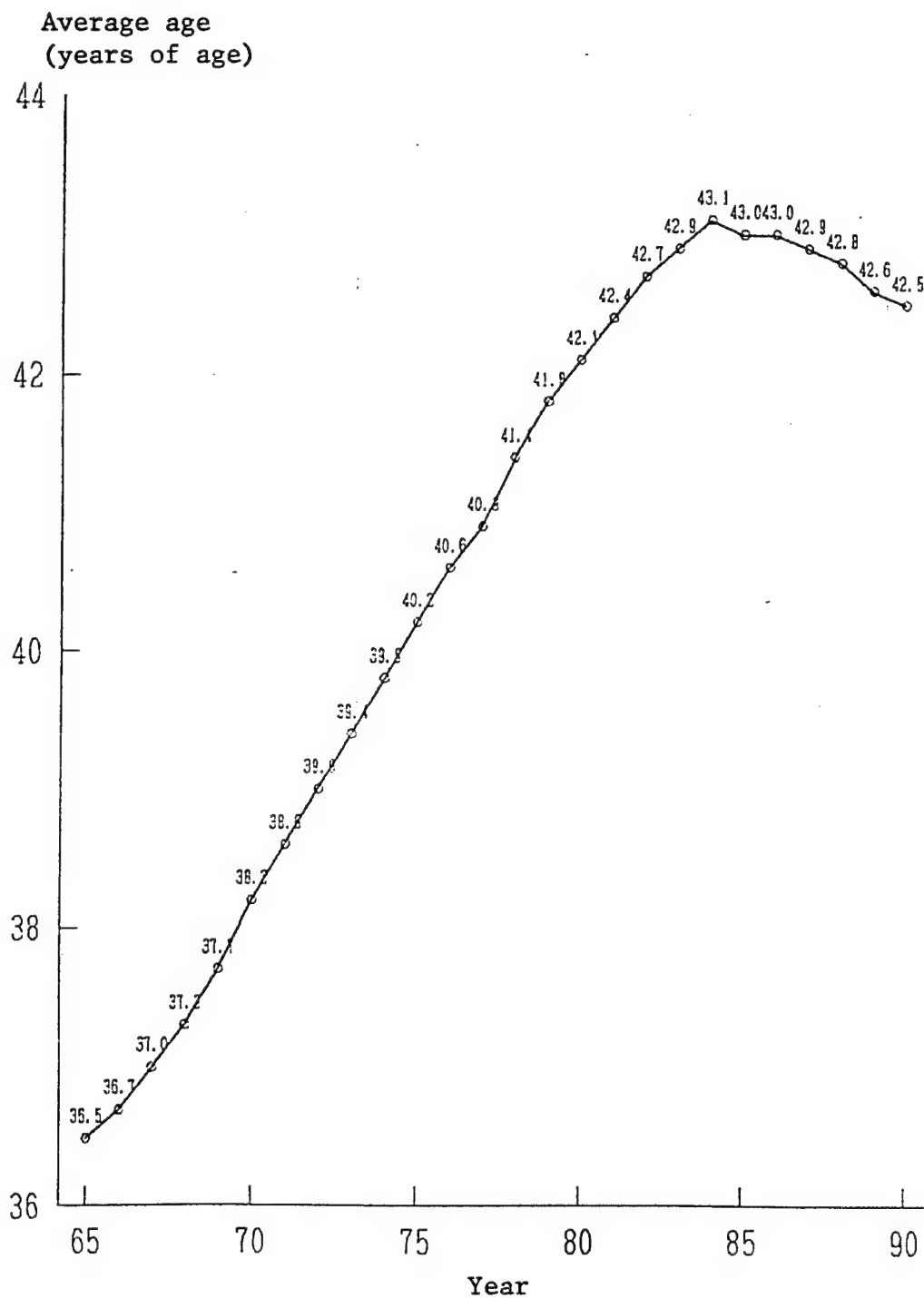
a. Research money from government ministries and agencies other than parent organizations	<input type="checkbox"/>	2% 30 67
b. Research money from local governments	<input type="checkbox"/>	15% 51 35
c. Research money from private foundations	<input type="checkbox"/>	9% 23 68
d. Research money from private enterprises and individuals	<input type="checkbox"/>	30% 34 35



- | | |
|--|----|
| 1. Flexibility and diversification should not be promoted at the expense of creating a gap | 1% |
| 2. I'm not sure | 34 |
| 3. Flexibility and diversification should be promoted, even at the expense of creating a gap | 65 |
-

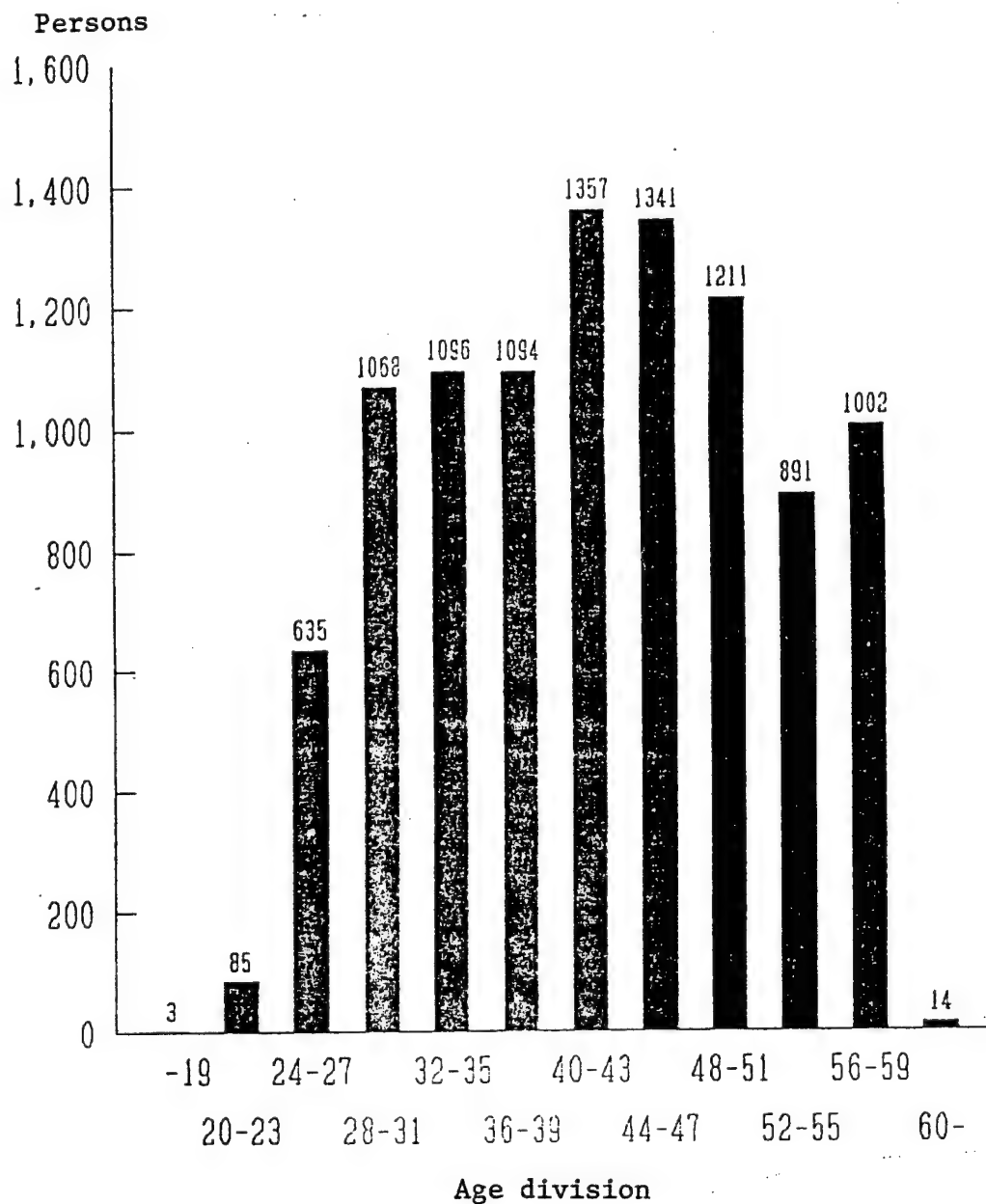


- | | |
|---|------------------------------|
| a. Every government laboratory should publicize the achievements of its researchers | <input type="checkbox"/> 4% |
| | 13 |
| | 84 |
| b. Every government laboratory should mount an active public relations campaign to enlighten the people about its activities and its budget | <input type="checkbox"/> 2% |
| | 16 |
| | 81 |
| c. Every government laboratory should conduct a comprehensive self-evaluation | <input type="checkbox"/> 1% |
| | 15 |
| | 84 |
| d. Every government laboratory should receive periodic evaluations by a third-party organization | <input type="checkbox"/> 12% |
| | 41 |
| | 47 |
-



(Sources) Annual and monthly reports published by the
National Personnel Authority

Figure 1. Changes in the Average Age of Researchers at Government Laboratories

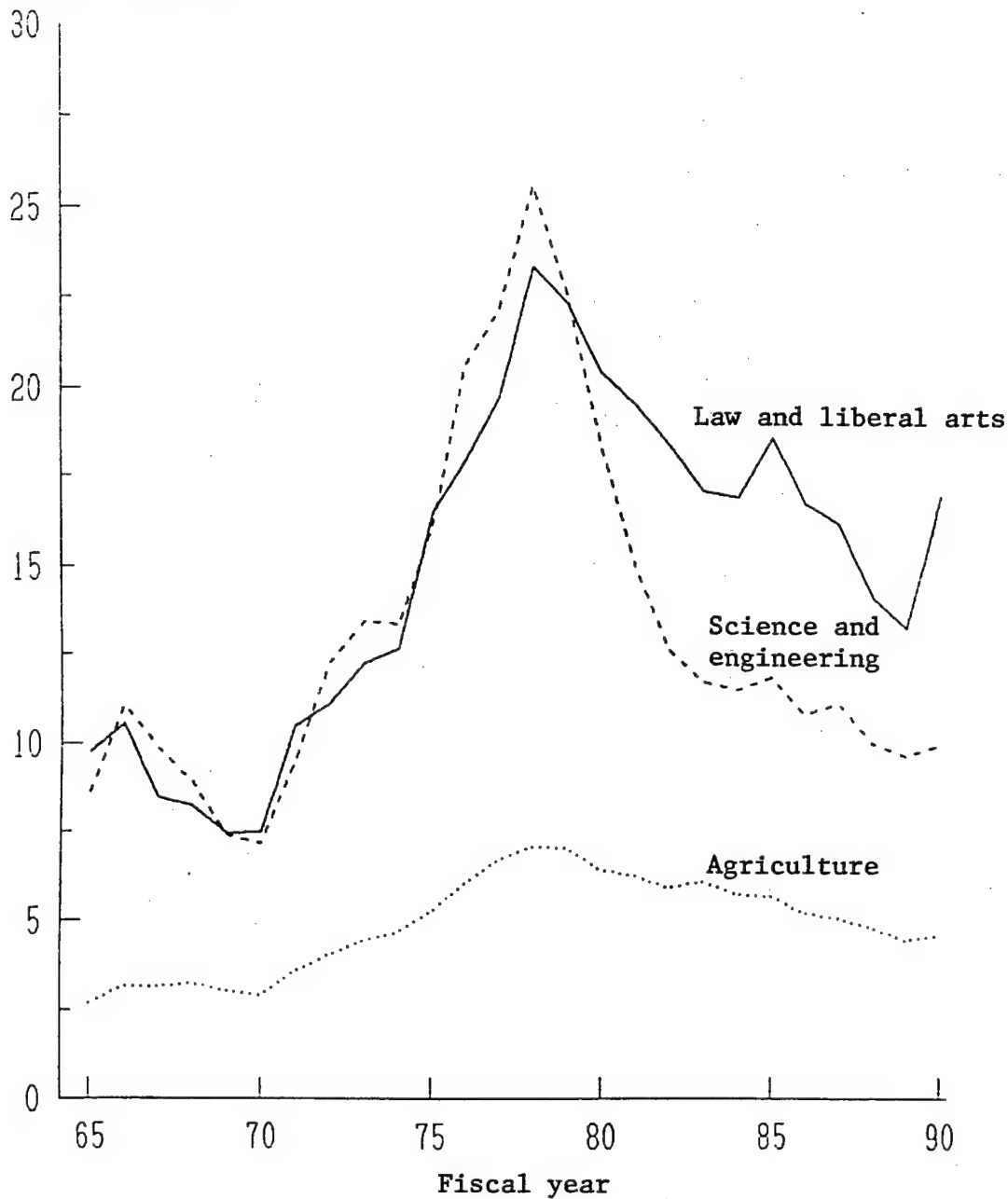


(Source) "A Survey Report on the Actual Status of National Public Officials, Including Their Salaries," by the Bureau of Compensation, National Personnel Authority

Figure 2. Distribution of Ages of Researchers at Government Laboratories (as of 15 January 1990)

Applicants

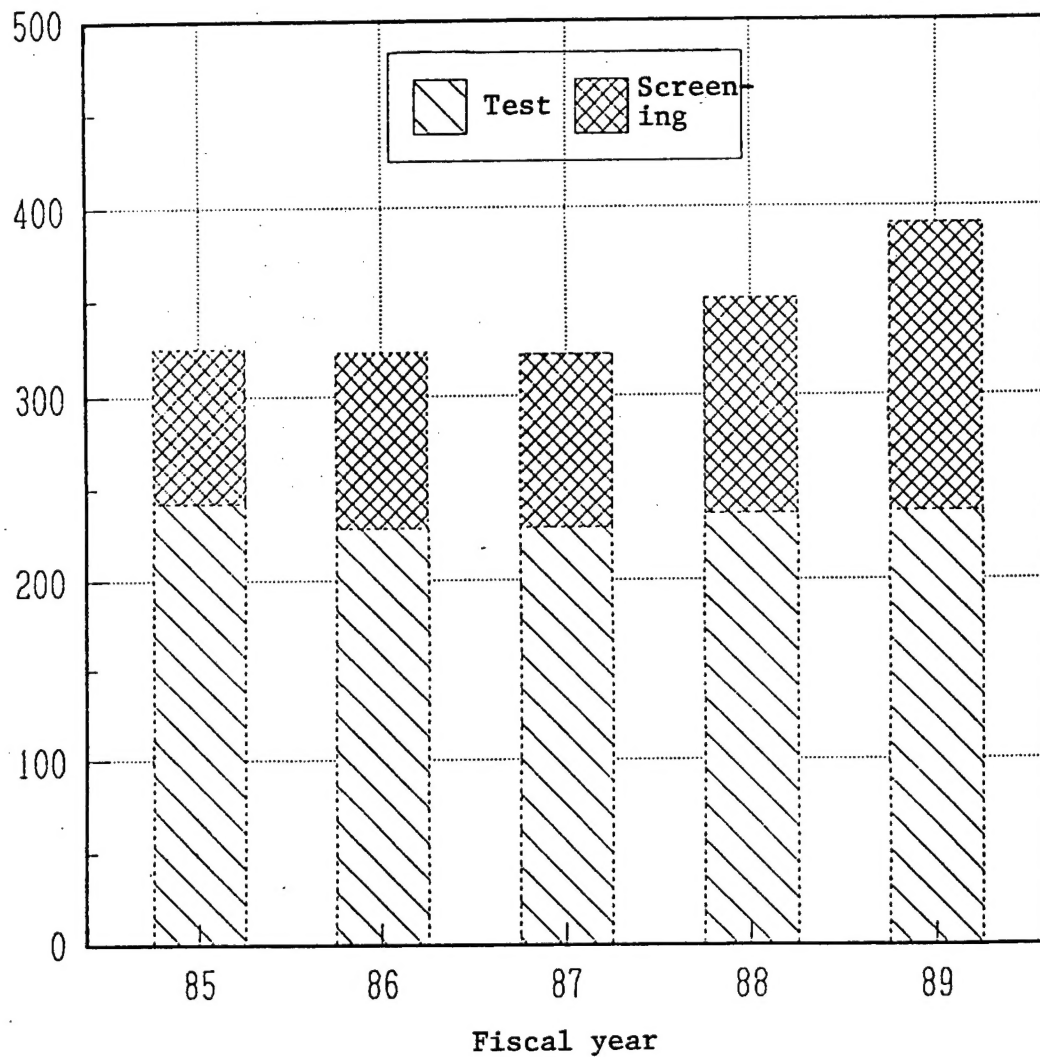
Unit: 1,000 persons



(Source) National Personnel Authority's FY 1986 Annual Report, with some added information

Figure 3. Changes in the Number of Applicants for Category I (Candidates for Senior Government Posts) Tests by Field

New hires

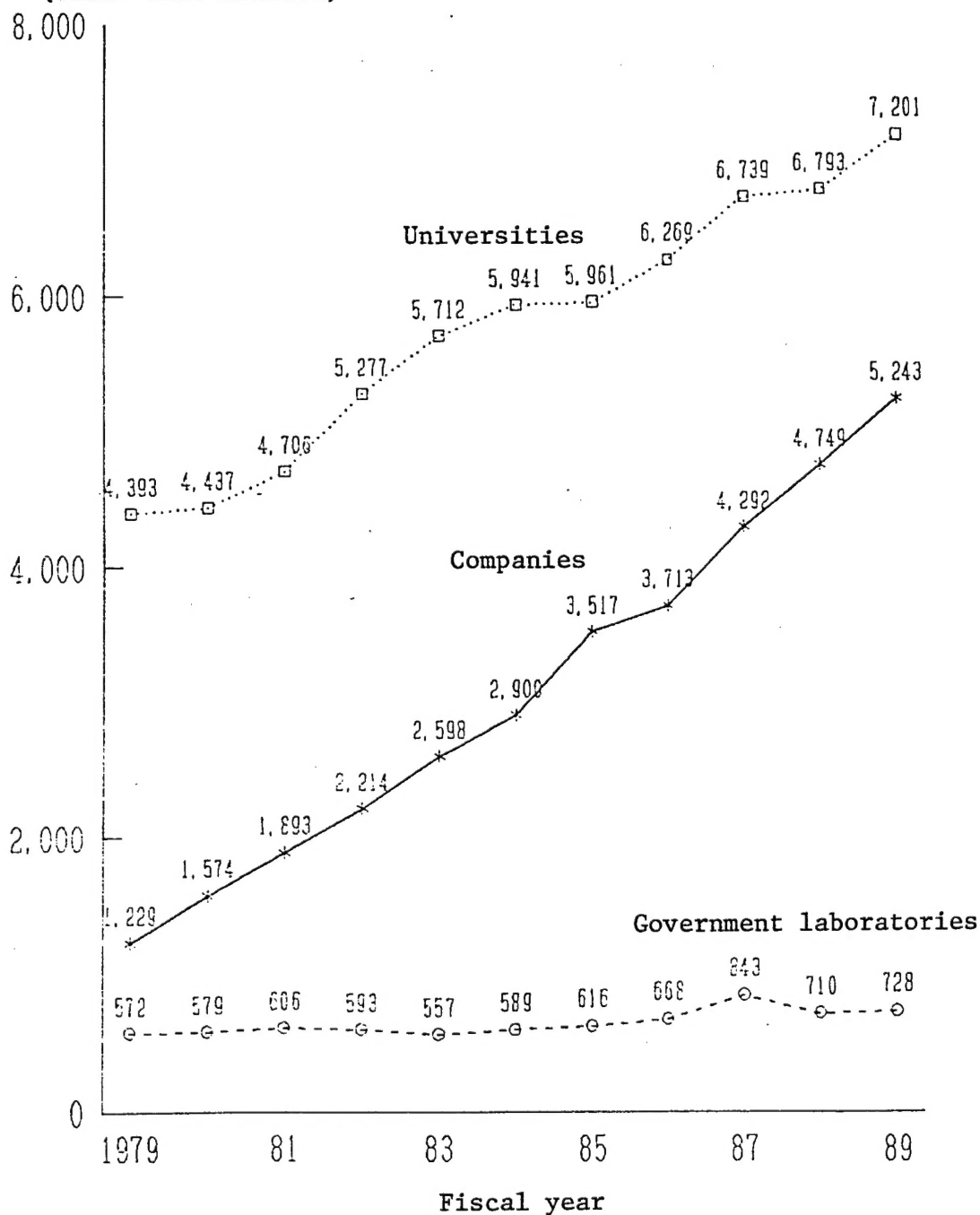


(Source) "Survey Report on Posting of National Public Servants Into Posts of the Regular Government Service Category in 1989," by the Bureau of Recruitment, National Personnel Authority

Figure 4. New Hires for Government Research Posts, Centered on Those Recruited by Tests

Expenditures for basic research

(Unit: ¥100 million)

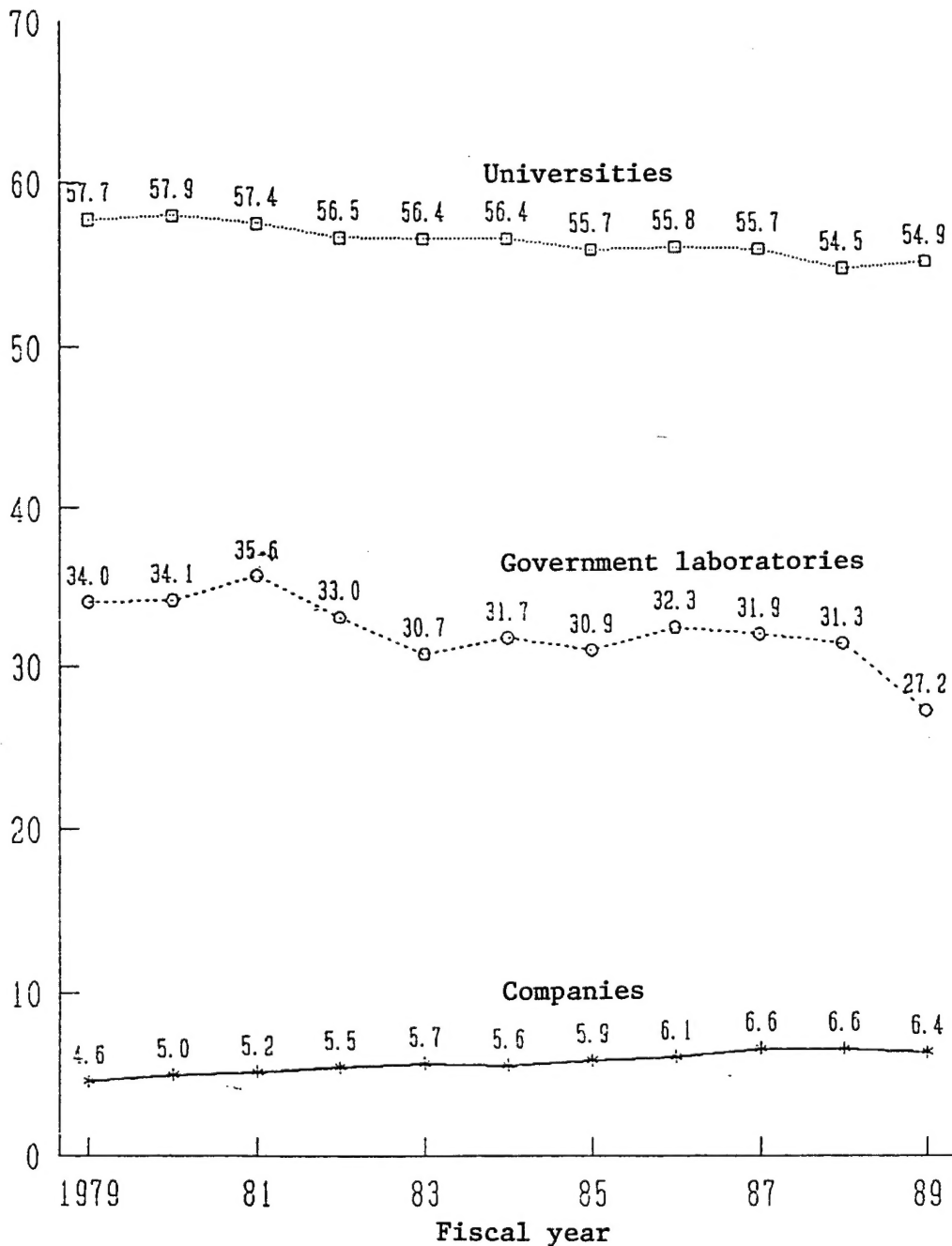


(Source) "Survey Report on Science and Technology Research," by the Statistics Bureau, Management and Coordination Agency

Figure 5. Expenditures for Basic Research

Basic research ratio

(%)



(Source) "Survey Report on Science and Technology Research,"
by the Statistics Bureau, Management and Coordination Agency

Figure 6. Comparison of Basic Research Ratios

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SPRINGFIELD VA

22161

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